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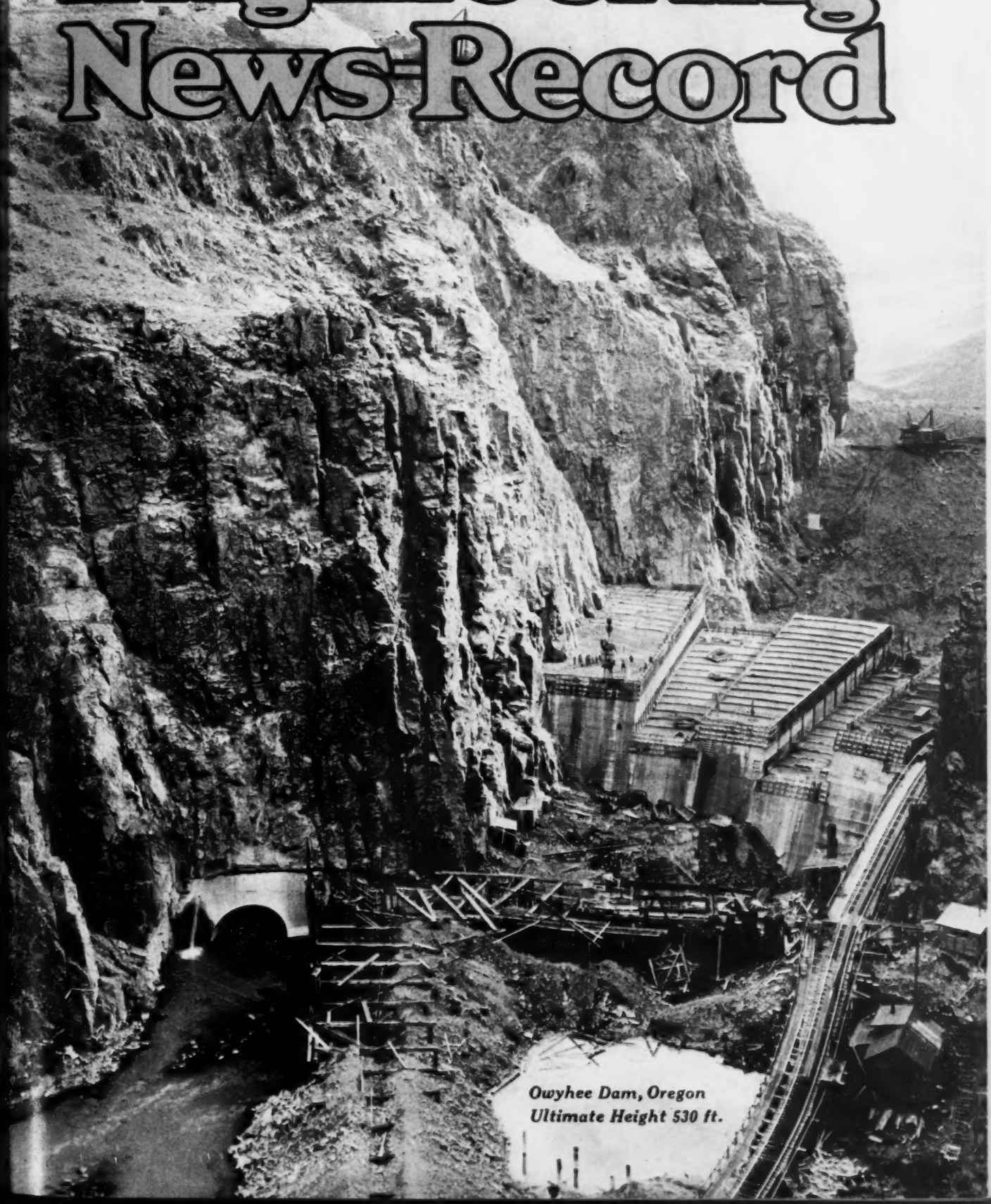

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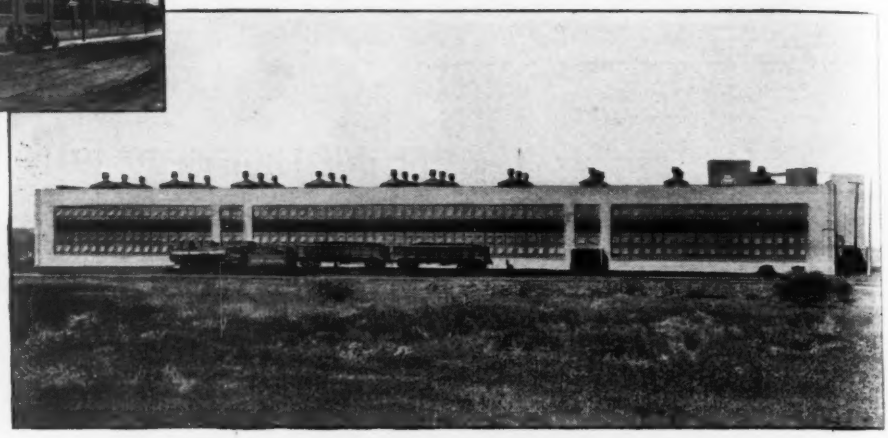

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F. E. SCHMITT, *Editor*

Volume 106 NEW YORK, JANUARY 29, 1931 Number 5

Technical Performance

UNEXPECTED technical strength characterized last week's annual meeting of the American Society of Civil Engineers. It proved anew that remarkable resources for well-directed, concentrated study reside in the organization, proof that is the more gratifying in view of the diffuseness of some meetings of recent years. The highway and structural sessions showed special strength, due perhaps to the more immediately active nature of their subjects: windbracing and prequalification. As the discussions were informative and stimulating not only to those who specialize in structural and highway work but to engineers of every class, it is once more a matter of regret that the segregation of technical divisions tends to limit the educational value of their work. This segregation, incidentally, excluded from the prequalification discussion many of the men most vitally concerned, for the highway and construction divisions held separate sessions simultaneously. But these are, after all, minor matters; continued vigor of technical performance will make all details of society operation secondary.

Vertical Transportation

IT IS somewhat singular that the elevator, which made the tall building practicable, should now present one of the vexing problems of future skyscraper development. The fact is that building owners begrudge elevators the space they occupy, with the result that numerous attempts have been made to provide increased traffic capacity in a single shaft. Larger and faster cars have been used. In the new Cities Service Building in New York double-deck elevators will be installed. The latest development, described elsewhere in this issue, involves the use of two cars in the same shaft, one serving the floors in the upper half of the building, the other those in the lower half. This running of two cars where one ran before has long been regarded as ideal, and now that the difficult problems of safe control have been solved successfully its possibilities will warrant careful study on every building project. The principal advantage of the dual system, as it is called, is that it requires only half as many shafts, although each shaft must be somewhat larger than for single-car operation. Against this benefit are arrayed several possible disadvantages. Double-deck lobbies at the lower landing will offset some of the space saving. Fewer elevator shafts mean reduced opportunity for locating deep windbracing, since this is best placed in shaft walls. Yet if the problems of efficient schedule operation can be so worked out as to give the regularity and frequency of service to which elevator users have become accustomed, the dual system promises to play an important part in shaping the future of high buildings. It will definitely extend their economic height range.

Comparative Construction Costs

AT PRESENT the prices of many commodities are substantially lower than they have been for several years. How do building and other construction costs line up with the commodity price situation? Correct information on comparative construction costs is vital to those selling construction service and materials. Wm. J. Barney in this issue presents definite figures to show that building prices in New York City have decreased to 80 per cent of 1925 prices, recognized as the peak of the past decade. That a comparable reduction has occurred in the cost of construction work other than building is indicated by an item showing 18.5 per cent reduction in bids on a Detroit reservoir over an almost identical structure awarded two years ago. Accurate comparison of construction costs is difficult because of inevitable difference in conditions on almost every job, but in both the above-named instances the close similarity of structures and conditions made precise estimate of cost differences possible. But it is also true that the cost investigations cover only two classes of construction and are limited to very narrow geographical fields. Similar cost comparisons need to be made in all parts of the country, on a wide range of construction work. Only by such a showing of its efficiency of performance can the construction industry hope to realize the full opportunities of the times.

Concerning Unemployment

WHERE much thought is being given to providing employment for the idle, obviously every effort ought to be made to avoid stopping work already under way. This conclusion applies to a current question of unusual character. Something approaching ten million dollars of construction work on federal reclamation enterprises is under contract for the current year, but there is danger that part of the work may have to be shut down. For the first time in history the contributions to the reclamation fund are short—due to decrease in oil royalties and land sales, deferment of some reclamation repayments and like causes—and not enough money is available for the year's work. To make up the deficiency, Congress has been asked for a loan of five millions to the reclamation fund. Unless the loan is granted, half of the work to be done this year must stop. This work, be it noted, has been started under specific direction from Congress, and most of it has been fixed by contracts with project farmers who are depend-

ing on its prompt completion. For more than one reason, therefore, the loan is in order. Above all, no work already begun and organized should be brought to a stop and the number of unemployed made larger.

Regrettable Delay

THAT the authorities of the American Society of Civil Engineers failed to vote immediate approval of the recently reached architect-engineer agreement gives rise to disappointment and regret. The failure means delay, and perhaps costly delay, since legislative bodies now in session might be induced to enact constructive legislation on the basis of the agreement if its terms were ratified by the society. True, the differences at issue in the agreement are complex, and the meetings of the board of direction must dispose of a large budget of important questions in a limited time. Moreover, the particular case on which the agreement was founded arose in New York, while most members of the board are from states in which no similar issue has yet come up. Adequate presentation of the subject to the board by a member of the joint committee might have brought about a different result. While ultimate ratification is certain, the pressure of time makes the present delay irksome. But for the time factor, indeed, it would be natural to expect the board to lay the question before the entire membership of the society.

Adequate Tools for Research

SIX months ago, when planning of the great national hydraulic laboratory at the Bureau of Standards was just beginning, we expressed the hope that broad vision might guide the work, to the end that the laboratory should surpass in scope and excellence the best existing institutions. This hope, based on the rapidly growing requirements of hydraulic construction, finds welcome support in resolutions passed last week by the American Engineering Council and the American Society of Civil Engineers. What they urge is simple and clear: that the magnitude of present and coming problems of practice be reflected in research facilities of corresponding proportions. Effective research requires good tools, and, although valuable researches have at times been carried out with only primitive facilities, any dependence on less than adequate tools would handicap the work that is to be done in the laboratory. The authorities of the bureau know this well, of course, and any difference of view is doubtless founded on difference of judgment as to requirements and means. The resolutions, therefore, are valuable as reflecting the belief of the civil engineering profession that practical work calls for equipment of large capacity and range. Means should not stand in the way; if construction of an adequate laboratory goes beyond the money so far appropriated, the profession will join the bureau in asking for additional funds.

Two Decades

WITHIN the fortnight two notable gatherings came into contrast. The American Institute of Consulting Engineers looked back on twenty years of existence. The Engineering Council reviewed its first decade. To both we desire to extend congratulations. Strangely unlike, they yet are similar in purpose. The consulting engineers number barely over 100 members, the council more than 50,000; the former meet directly, the latter through delegates. Their aims are similar, though the consulting engineers are devoted more to professional relations, the council more to public service through advice to public authorities on proposed legislation or administrative action. What part they will play in the growth of professional life in the future cannot now be forecast, but we know that they will be more needed each year, in view of the ever closer interlacing of engineering work and public affairs. The consulting engineers, standing for the interests of professional independence, a mission far beyond the measure of their present membership, face the difficulty of small influence due to small numbers. The council, with the strength of a great constituency, has built up an acknowledged position in government bureaus and legislative halls, but its main productive work is still before it. For both organizations it is probably true that their future achievement and power will be proportioned to the strength of their leadership. Farsighted purpose and force, rather than system of organization, will determine their coming years.

Wind Resistance

THE past week was noteworthy in the field of wind study and wind resistance as related to high buildings. The meeting of the American Society of Civil Engineers brought out the fullest discussion yet had of the wind-resistance problem. Structures rising a thousand feet into the air, and intended to house busy masses of humanity in safety and comfort, make the subject more important than any other in the field of the structural arts.

For the first time in public discussion of the subject the concept of movement of buildings came to the front. Deflection and vibration took the lead in interest, and the mathematics of strength calculation were crowded into the background. This opens a promising road to progress, for it means that attention will be centered on the physical behavior of buildings, knowledge of which will solve the existing strength problems as well as those of limiting movement.

One leading result of the discussion was the showing that we know surprisingly little about either wind force or the way in which tier buildings resist wind. Height variation of wind has become important, now that we are getting above the level of surface winds; but the few available height measurements are inconclusive, and in any event they relate to ordinary winds, not to storms. Theories and experiments on the force exerted by smooth-flowing wind streams are at hand, but the tumultuous swirls of violent winds, such as wrecked the dirigible "Shenandoah," are unexplored. High buildings may have to resist such actions.

In the absence of quantitative knowledge, wind design of high buildings is largely empirical; and this is true even though the design is carried out by seemingly exact calculation from closely specified wind pressures. But a most important supplement to this statement deserves to be written down—namely, that practice constitutes a brilliant justification of these previously used design methods. Many hundreds of buildings are in service which combine height and slender proportions sufficiently to make wind action an important influence on their structure, and during periods of service ranging up to forty years they have given no evidence of distress.

Many of them have gone through severe storms, and a few through hurricanes of velocities and pressures not definitely known but considerably above those of recorded "severe" storms. This being true, occupants of high buildings may depend on the safety of their sttructures.

The structural engineer also finds assurance in this demonstration of practice. But he is equally concerned in noting that while his practice at some points provides large safety allowances—as in disregarding masonry cooperation and floor distribution, or even the reinforcing effect of the concrete encasement of columns and girders —at others it moves progressively toward the danger point. Wind loads, for example, are less than those which may frequently occur; wind on the lower stories is often disregarded; stresses are allowed to go high, lately to a point not far below the failure point of columns. Considering the large range of the unknown in wind action and wind resistance, conservatism counsels well-maintained safety margins.

As remarked, experience is satisfying as to the security of buildings of the kind common until now. But in three years heights have been doubled, and at the same time a beginning has been made toward eliminating wall masonry. Already we are out of the range of dependable experience. We may go farther, and the validity of empirical proof then becomes doubtful. Wall masonry has unquestionably contributed to the strength of existing buildings, and if it is removed, and the frame made no better, buildings will be weaker and more flexible. Before we go very far we must know more than rule of thumb.

Experimental study was urged in the report of a special committee on windbracing of high buildings presented at last week's meeting, and in the discussion. It is fundamentally important. Forty years of high building construction are behind us, and nothing has been accomplished in the way of measuring wind force or building behavior. In stepping out of the range of the practice supported by the experience of the past we are no bolder than the pioneers of the early nineties, but our justification by experience is still to come. The argument for immediate prosecution of broad experimental study of high buildings is irresistibly strong.

In this study wind forces will have to be measured, of course, to correlate with building behavior. But they will be the forces exerted by usual rather than by unusual winds, and will not tell directly what maximum force may be exerted by a great storm. The greatest winds are rare, and doubtless variable; actual design provision for them will always involve judgment, allowance for special wind phenomena, and knowledge of the relation of the building structure to the force. Possibly design will always have to give some thought, also, to other lateral disturbance, as vibration from earth tremor. In any event, mere knowledge of maximum forces will not make buildings comfortable or even safe, unless the manner of action of the building is thoroughly known. But the security of small parts of a building—wall panels, parapets, turrets—depends more directly on the local violence that may occur in a storm, and here a knowledge of maximum forces or else the use of higher safety margins is essential.

Thus, experimental investigation will be concerned mainly or exclusively with building behavior. This offers a phenomenally wide and difficult field, reason enough for taking the study in hand at once. Plans already made reveal a sufficiently clear recognition of the situation to promise steady progress in actually organizing the investigative work. We hope and believe, therefore, that the present year will mark the beginning of an active period in developing knowledge of wind resistance and placing high-building design on a basis of scientific rather than empirical design.

Expediting Road Work

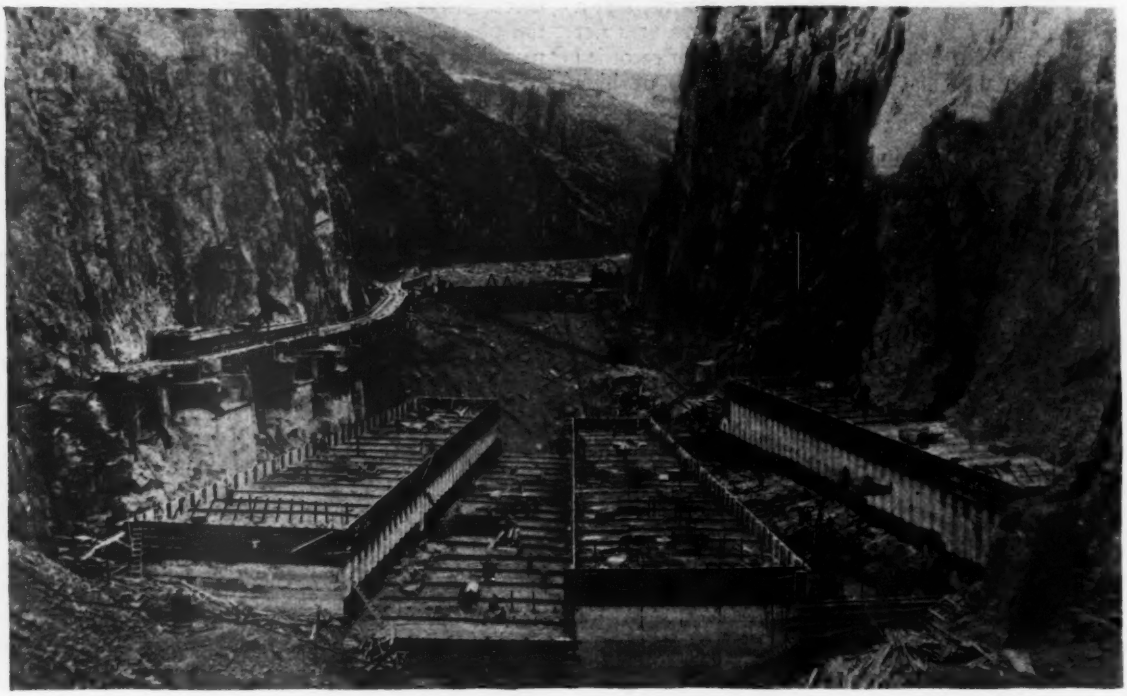
THE magnitude of the assistance given to 1931 roadbuilding by recent government action is scarcely realized until one sees the figures set down, as in the tabulated statement published in our news pages two weeks ago. Until the totals are analyzed it is hardly conceivable that the contribution of some $65,000,000 by the states will set free $235,000,000 of federal money. Without the contribution of a single dollar of state funds, the federal treasury will hand over to the states $168,000,000 for expenditure on federal-aid roads.

Even in the astounding budget of two billion dollars for highway improvement in 1931, estimated by the executive secretary of the Association of State Highway Officials, this federal money is a notable item. It is money in hand for immediate commitment in contracts. The $80,000,000 loan to the states must not only be committed by contract but actually be expended during the remaining eight months of the year, or the unexpended portion is voided. Since the loan as well as the other recent federal road measures have the special purpose of meeting the unemployment emergency, the states have a very definite obligation to advance their construction programs ahead of the normal order.

Contracts should be let now, not in March and April, for every mile of highway whose plans are ready. State legislatures and executives should urge their highway departments to speed up, and above all should block any inclination of the state budget makers to withdraw state funds—and this is more than a possibility—to the extent of the federal loan and thus defeat its purpose to provide added work. At best the added work can provide only about 40,000 more road jobs than did the work of 1930; it would be unfortunate if this help, small as it is, were lessened by procrastination.

Another phase of the matter is of equally critical character. If delay is to be avoided, present organizations for carrying on road work should be preserved, and not disrupted. This being so, it is alarming to note that, with the greatest of all roadbuilding years just ahead and the crying demand of wide unemployment for immediate and fast construction, state administrations, changed at the last election, are showing a cheerful willingness to throw the proverbial monkey wrench into well-functioning mechanisms by dismissing highway department heads.

In all but a few states this business idiocy is applied only to the leading positions, so that enough wheel horses are left to move the normal load. But more than the regular burden must be carried this year, and at greater speed, and this demands all the initiative and driving power that long experience can give. It is not discrediting the new official to say that he will not have at this critical emergency the sure hand of the veteran. A time when state highway departments are being urged to help carry unemployment over the mounting stream of depression is a poor time to swap horses. It is a time when highway directors and chief engineers need to be left undisturbed to work out the serious problems of the day.



Concrete placing begins on the 530-ft. Owyhee Dam

Foundation Procedure at Owyhee Dam

Mining methods used to remove 38,000 cu.yd. of faulted material to sound rock 190 ft. below streambed—Concrete deposited at 1,000 cu.yd. per shift by 8-cu.yd. buckets from overhead cableway

FOUNDATION problems, complicated by the necessity of excavating and concreting a fault zone 190 ft. below streambed, have been solved at the 530-ft. arched-gravity dam being built for the Owyhee project in eastern Oregon, and concrete placing on the main structure is well started. The original plan called for sealing the fault which traverses the canyon lengthwise at the upstream cutoff only, but foundation excavation indicated the need for completely removing the material from the entire 250-ft. length of fault zone under the base of the dam—a possibility that had been anticipated. Removal of the 38,000 cu.yd. of material from this crevice by mining methods was followed by replacement with concrete. Completion of this work permitted concreting operations on a full scale, and about 1,000 cu.yd. per shift are being placed in the structure from an 8-cu.yd. bucket handled by overhead cableway. The absence of any concreting tower, maze of guys, wires or chutes common to construction work in this type of narrow canyon dam site is one of the most noticeable characteristics of this project.

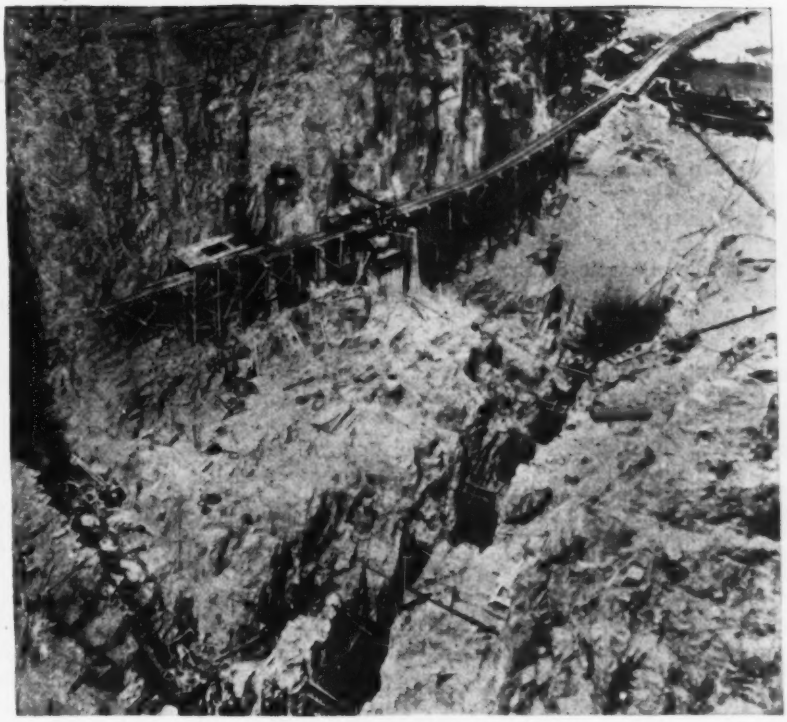
The design features of this record-breaking structure being built by the Bureau of Reclamation to provide 715,000 acre-ft. of live storage for the Owyhee irrigation project were described by J. L. Savage, chief designing engineer of the bureau, in *Engineering News-Record*, April 26, 1928, p. 883. A progress report, including a description of the river-diversion work, appeared in the issue of Aug. 15, 1929, p. 248, and a brief description of the cableway system in the issue of July 10, 1930, p. 62.

Geology—The dam site was formed by the present Owyhee River cutting a narrow gorge 400 to 600 ft. deep through a flow of rhyolite which blocked the valley subsequent to the deposition of the original tuff underlying the district. The outer surface of this flow of rhyolite moving on the original tuff—probably in contact with water—chilled comparatively quickly, producing a layer of pitchstone agglomerate, roughly about 25 ft. thick, extending as a contact between the two materials. Subsequent erosion has removed the upper levels of this rhyolitic flow, and the river had cut its gorge down into the remainder. This rock, which forms the abutment and foundation material for the structure, is an extremely hard crystalline mass due to the slow interior cooling of the flow. Beneath it lies the stratum of more elastic pitchstone agglomerate as a transition material blending into the softer tuff.

A fault in the center of the streambed parallel to the canyon subsequently has occurred with horizontal displacement. Exploration of this fault zone with diamond drill borings showed that faulted material was evident in the hard rhyolite in the form of small shattered pieces, but indicated that the disturbance lessened in the more yielding agglomerate and practically disappeared upon entering the tuff.

The original plan provided for the removal of this faulted material on the line of the upstream cutoff by means of a shaft to the undisturbed tuff. This would provide a seal to prevent the passage of water through the fault zone under the dam. Excavation work in this cutoff shaft and general foundation excavation along the upper portion of the fault revealed fractured and loose material, which made it advisable to remove the material in the fault zone throughout the entire width of the structure and refill the crevice with concrete to insure proper foundation conditions. This possibility had been foreseen as a result of the drilling and was provided for in the specifications.

As a safety measure prior to any extensive work in the gorge, about 19,000 cu.yd. of loose and unstable rock was stripped from the almost vertical canyon walls. This material and an additional 93,000 cu.yd. of strippings were removed from the canyon floor by dragline and train to be used in building the upstream and downstream rock-fill cofferdams (see *Engineering News-Record*, Aug. 15, 1929, p. 248). Some of the excavated material was removed to the camp location about one-half mile downstream and used to level and extend the yard area. To complete the general foundation and abutment excavation 87,000 cu.yd. of solid rock was removed from walls and streambed to provide sound rock in the proper plane to take the thrust and loads of the structure.



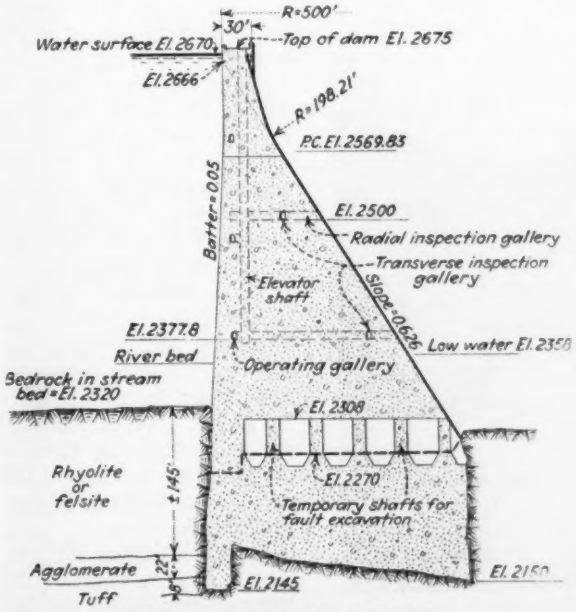
Shaft forms in fault excavation

Open trench work completed and concrete filling being placed around shafts.

Fault Excavation—From general bedrock level in streambed, which ranged from 40 to 60 ft. below water level (El. 2,358), a deposit of loose alluvium was removed from the fault zone by dragline for a depth of nearly 50 ft. Below this river deposit the broken and shattered rock of the fault proper was encountered, and hand work was required to load the material in skips for hoisting by cableway. To continue excavation in open cut would have required excessive timbering to hold the material in the upper section of the crevice, and as a result the alternative was adopted of concreting the top 50 ft. of the fault zone as soon as excavated and proceeding with the excavation work through shafts left in the concrete.

The main concreting plant was finished at this time, and in May, 1930, the 250-ft. open cut 50 ft. deep, representing the length of fault zone lying under the dam, was filled with concrete. Five 12x12-ft. shaft openings were left in this concrete, spaced approximately equidistant from cutoff to downstream face. Excavation of the faulted material under this concrete was then continued through the shafts, the skips being hoisted by the main overhead cableway except at the cutoff location where a timber headframe was used. No attempt was made during the work of sinking to remove all the faulted material, the plan being first to excavate as rapidly as possible to the maximum depth required and later strip to the lateral limits of the fault zone as the concreting was carried up.

Interconnection between the shafts along the line of the fault was maintained as sinking progressed. The entire open space under the concrete pour was heavily timbered with square sets for a width varying from 15 to 18 ft. Excavation proceeded through about 83 ft. of faulted and broken rhyolite, 22 ft. of the agglomerate and 10 ft. into the practically undisturbed tuff to El. 2,145, at a depth of about 213 ft. below low water level of the river. It is of interest to note that the level of actual excavation required to reach undisturbed material



Maximum section in fault plane

Heavy dotted line at El. 2,270 indicates lower limit of section on either side of fault.

below the zone of fracture was within 2 ft. of the estimated depth established by the exploratory borings in the zone.

Excavation work was then begun at the bottom in widening the crevice to the solid undisturbed rock of the side walls. The width of excavation varied from 15 ft. to a maximum of about 30 ft. As excavation was completed in various sections along the bottom of the crevice the timbering was removed and the space filled with concrete. This work was comparatively slow and dangerous, because of the loose fault material tending to move down the side of the excavation combined with the necessity for removal of the timbering before concreting. The result was that concrete was placed in 117 small pours averaging about 200 cu.yd. each. The work of excavating and concreting this part of the fault zone was carried on from June to September, 1930. Provision was made for grouting the foundation rock adjacent to the fault wherever it appeared that grout could be introduced. This work in the crevice was concluded by the time the main cutoff trench excavation has been completed, the grout drilling finished and general preparations made for the pouring of the main structure, which began Sept. 23, 1930.

Concrete Plant—Extensive search for a quantity of aggregate sufficient for the 540,000 cu.yd. of concrete in the structure resulted in the discovery of a gravel deposit of sufficient size and proper grading at the junction of the Owyhee, Boise and Snake Rivers about 25 miles from the site. This deposit, which is principally well-worn granite material deposited from the Boise River and naturally graded by much washing, was made the terminal of the construction railroad which connects with the Oregon Short Line Railroad at this point.

Stripping of the pit and loading is done with a 3-yd. dragline, the stripping averaging 1 cu.yd. per 3 to 5 cu.yd. of gravel removed. The pit run gravel is loaded directly into standard 35-cu.yd. gondola cars and hauled to the washing and grading plant at the site. The advantage in concrete control to be obtained by having the washing plant located at the pit with the longer period for drainage of the sand was relinquished to save the contractor the expense of providing duplicate elevating equipment and bunkers.

Bucket approaching loading position

Operator stationed in booth suspended on canyon wall directs movement of the bucket.

At the dam the gravel is run through a scalping screen, which removes all rock over 8 in. in size. So near to an 8-in. maximum size does the natural gravel run that the crusher which handles the oversize runs only about an hour per shift.

Elevated to the screening plant the gravel is washed and screened into sand up to $\frac{1}{4}$ in. and three sizes of coarse aggregate—$\frac{1}{4}$ to $\frac{7}{8}$ in., $\frac{7}{8}$ to $1\frac{3}{4}$ in., and $1\frac{3}{4}$ to 3 in., using round screen openings. All material passing the 3-in. screen is cleansed as cobbles. From the screening plant the sizes drop into stock piles proportioned in size to the estimated grading of the natural gravel with a capacity for about 4,000 cu.yd. of concrete. All bearings in the plant are of the roller type, and those on the machinery are self-aligning to provide for slight settlement in the structure.

From the usual tunnel arrangement under the stock piles the various sizes of aggregate are taken by belt conveyor to the bins over the mixing plant, which have a combined capacity for about 100 cu.yd. of concrete. Cement is delivered in bulk, unloaded from the box cars by scraper and elevated to a silo, whence it is moved by screw conveyor to the batching plant. The entire screening and concreting plant is designed to produce 1,000 cu.yd. of concrete in 8 hours for extended runs.

Proportioning of all aggregates is done by weight. The batch of aggregate is weighed accumulatively, and the cement is weighed separately

Screening and mixing plant produces 1,000 cu.yd. per hour

Gravel brought 25 miles by train is separated into sand and four sizes of coarse aggregate. Plant at left houses two 4 cu.-yd. mixers.

on more sensitive scales graduated to 2 lb. . Following specifications, water is measured directly into the mixer by meter and is under immediate control of the operator for each batch to provide for flexibility in water regulation. The batches from the two weighing plants drop into the two 4-cu.yd. mixers for a 1½-min. mixing period. Each mixer is amply powered by a 100-hp. motor and has a dumping angle of 57 deg., permitting complete discharge in less than 10 sec.

Concrete Control—Proportioning of the mix has as its objective the production of a finished concrete, which is an economic balance between the qualities of strength, impermeability and durability, with due regard for the desirability of using all the coarse aggregate brought to the site. The result of this balancing of concrete characteristics is the use of 1 bbl. of cement per cubic yard of concrete in the dam. The strength of the concrete averages about 3,500 lb. at 28 days, which is approximately six times the maximum stress of 600 lb. used in the design and more than double the specification requirements of 1,500 lb. However, consideration of the factors of impermeability and permanence account for maintenance of this cement proportion. Concrete placed within 3 to 4 ft. of the upstream face is enriched by increasing the cement content to 1.25 bbl. per cubic yard.

The mix is varied from 1 : 2.7 : 6.45 to 1 : 2.5 : 6.65 by weight for cement, sand and coarse aggregate. The sand is maintained from 2.7 to 2.5 times the weight of cement, but the other four sizes of aggregate may be varied within the 6.45-6.65 limits to permit complete use of the coarse aggregate available. Proportioning of a representative 4-cu.yd. batch is shown in the accompanying table. Proportioning of the natural gravel has permitted the successful use of all the material brought to the site with no excess in any size. This is of distinct advantage to the contractor because no payment is made for aggregate brought to the site and not used.

The water-cement ratio is 0.9, which amounts to 108 gal. per 4-cu.yd. batch; the slump is from 1 to 3 in. As previously mentioned, the proximity of the washing plant and the short interval between washing and mixing makes the water control difficult. The water content in the sand and pea gravel has occasionally run so high that no free water has been added to the mix. As a general rule, however, the water added averages between 20 and 50 gal., as compared to the 108 gal. required for a batch of dry aggregate.

Careful check of the water content in the sand is maintained, aided by a recently devised scale which permits the direct determination of the percentage of moisture. However, so extreme is the fluctuation of the water content that often it is necessary to change the water charge by inspection of the concrete in the batch, without waiting for the result of check analyses.

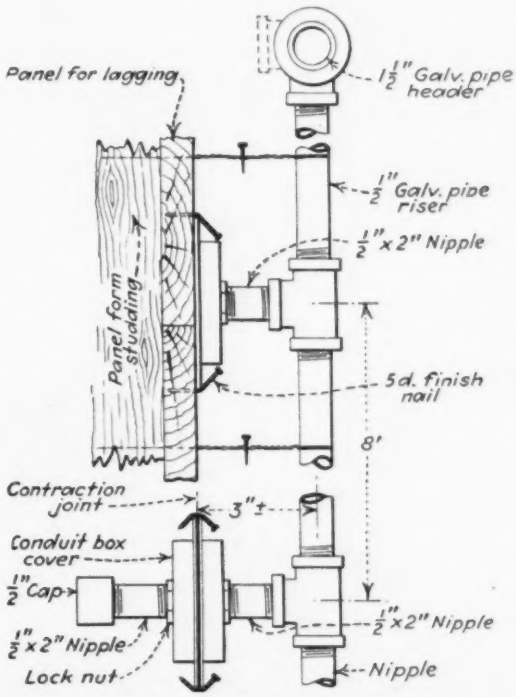
The batches of the two mixers are dumped simultaneously into a two-hopper, 8-cu.yd. car built to fit the spacing of the mixer set-up. The hoppers have no doors and are emptied by tilting to a central point of discharge by oil-operated hydraulic hoists. Elimination of doors in the car design was made for the special purpose of preventing the objectionable leakage of grout. The concrete car is hauled about ¼ mile by gasoline locomotive along the wall of the canyon on a timber trestle to a point where it discharges into the 8-cu.yd. bucket for placement in the structure.

CHARACTERISTICS OF A TYPICAL 4-YD. BATCH

Material	Mix	Size, Round Hole Screens, In.	Weight, Lb.
Cement	1	.....	1,510
Sand	2.7	Up to ¼	4,080
Pea gravel	6.45	¼ to ¾	2,720
No. 2 agg.		¾ to 1½	2,570
No. 3 agg.		1½ to 3	1,960
Cobbles		3 to 8	2,490

Water, 108 gal. Water-cement ratio, 0.90. Yield, 4 cu.yd. concrete. Cement per yard, 1.00 bbl. Slump, 2 in. Strength, 3,500 lb. at 28 days. Density, 0.86. Weight per cubic foot, 150 lb.

Concrete Placing—The loaded bucket weighs about 18 tons and is moved to position of placement by the overhead cableway spanning the canyon (see *Engineering News-Record*, July 10, 1930, p. 62). The operator, located in a booth suspended by cable on the canyon wall with full view of the concreting operations, maneuvers the bucket into position by means of an elaborate system of remote control to the motors at the cableway head tower. He handles six control levers—four for the friction and brake releases, and two for control of the two motors. Movement of the head tower on the curved track produces sufficient lateral range to reach from upstream to downstream face, and the other controls regulate motion of the bucket along the cableway and vertically. The control panel is served by 25 wires bound in a single cable.



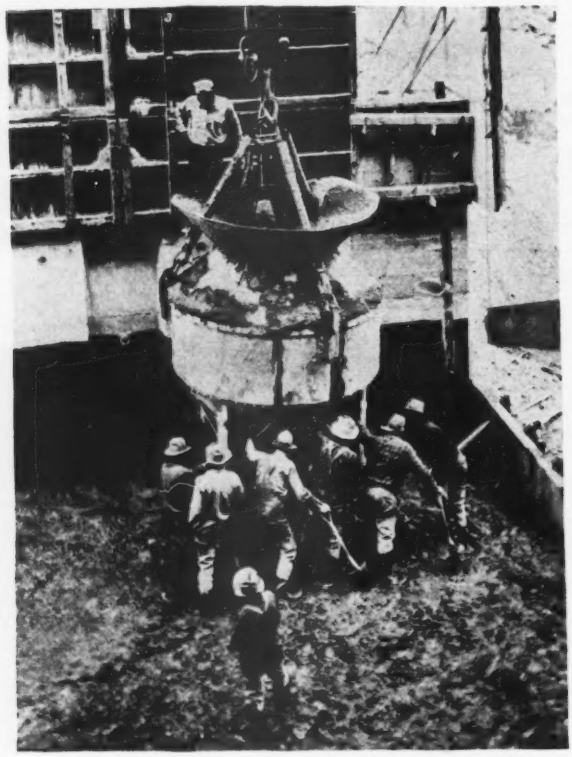
Grout outlet for contraction joints

First half outlet, placed against form, is protected with a plug of waste, which is taken out when form is removed. Also, bent nail fastenings are supplemented by tie wires to hold half together.

Spotting of the 18-ton load suspended from a 400-ft. vertical cable over the point of pour, particularly near the corners of the forms and around the grout pipes, involves the largest human-element factor in the entire concreting operations. Considerable skill is required on the part of the operator to perform this operation safely with a minimum of time lost in maneuvering. Some operators acquire remarkable proficiency in manipulating the controls to gage for sway, sag in the cableway and the indirect braking effects of the load. In the lower sections of the dam where pouring operations are below the elevation of the track from the concrete plant, round trips of the bucket are made in from 2½ to 3 min., except

when depositing in corners. Enough pouring has been done to indicate that the proposed rate of 1,000 cu.yd. in 8 hours can be attained.

The original bucket design used a horizontal slide gate with levers operated by men of the concreting crew. This scheme did not prove satisfactory because of the number of men required to pull open the gate and the necessity of spotting and maintaining the bucket within reach. An improved discharge arrangement, installed by the contractor, consists of a double-leaf drop gate released by a man who rides the bucket. In addition to operating the discharge, this rider assists in spotting the bucket by signals to the operator and closes the bucket doors after dumping by a hand-operated cable reel. This work provides the most spectacular job in the concreting operations, and the rider often has strenuous moments when the bucket bumps into position for a load or starts a swift swing across the canyon.



Bucket discharging 8 cu.yd. concrete

Bucket rider trips gate and reels it shut again, also helps guide bucket by signals to operator.

Pouring Procedure—Concrete pours are in 4-ft. lifts between radial construction joints varying from 50 ft. apart at the upstream face to about 30 ft. on the downstream near the base. A period of 72 hours is required before the following pour is permitted on the same section. Concrete is deposited in layers approximately 1 ft. thick, and the completion of the pour is finished by leaving the usual horizontal raised keys on 10-ft. centers. About 12 hours after completion of the pour the surface is brushed and cleaned with a blast of compressed air. Then, just prior to the beginning of the next pour, the surface is again thoroughly washed with water and compressed air, and a slush coat is applied to insure proper bond. Copper water stops are provided in each construction joint, 1 ft. back from both the upstream and downstream faces and around all gallery openings. The stops on the downstream face and around the gallery openings are provided primarily for the purpose of retaining the grout.

Grouting along the upstream face was provided for by a row of holes drilled in the bottom of the cutoff at 5-ft. intervals. The depths vary from 115 ft. along the base to 40 ft. near the top of the abutments. These holes are carried up as pipes in the concrete until at least a 5-ft. depth is poured and set over the adjacent area before they are grouted under a 200-lb. pressure. About 10 ft. downstream from the grout holes a row of drain holes is provided at 5-ft. intervals. These are drilled into the foundation rock subsequent to the cutoff grouting through pipes carried up in the concrete. In addition, twelve pipe connections to the foundation contact are being placed in various locations to provide for a study of uplift when the reservoir is put into service.

For grouting each construction joint a complete system of vertical and horizontal pipes is installed in the plane of the joint. Outlets, consisting of ordinary electric conduit boxes, are placed at 8-ft. intervals vertically on the risers which are spaced 3 ft. apart. The vertical spacing is staggered. This arrangement provides outlets on each in and out face of the vertical keyways, which have 3-ft. faces and a 9-in. depth. Horizontal header pipes of 1½-in. diameter for the application of grout are provided every 100 ft. above the foundation. After sufficient time has elapsed, following completion of the dam, these joints will be grouted under at least 100-lb. pressure in 100-ft. lifts beginning at the bottom.

Organization—The Owyhee Dam is being built for the U. S. Bureau of Reclamation to provide storage for the irrigation of 125,000 acres of new and partly developed land on the Owyhee irrigation project in eastern Oregon. The General Construction Co., Seattle, J. A. McEachern, president, and J. W. Lawlor, manager, has the contract for the dam and is represented by Ben Cook, superintendent, Charles Clapp, assistant superintendent, and C. Wood, resident engineer. Supervision of the work on the project is in charge of F. A. Banks, construction engineer, U. S. Bureau of Reclamation, with F. Schlapkohl, field engineer, and C. A. Betts, office engineer. R. F. Walter is chief engineer of the bureau at Denver.

Two-Story Water Tank in Scotland

The new water service reservoir for the city of Lossiemouth, Scotland, located on a hilltop near the city, consists of a 500,000-gal. circular concrete tank at ground level, topped by a 100,000-gal. tank for the purpose of furnishing adequate pressure to the higher sections of the town. The water for the town supply comes from springs on the Blackhills, some 10 miles to the south.

The lower tank has an internal diameter of 74 ft. and has a height of 22 ft. 9 in., designed for a water depth of 20 ft. Within the lower tank are 25 reinforced-concrete columns supporting the upper tanks, which is 40 ft. in diameter and 15 ft. 9 in. deep, designed for a depth of water of 13 ft. The floor of the lower tank is 9 in. thick, and is turned up at the perimeter for a height of 18 in. The wall rests upon this turned up portion with a layer of mastic asphalt between. As described in *Water and Water Engineering*, London, of Aug. 20, 1930, the new reservoir is to replace an old 60,000-gal. steel tank which has been in service at Lossiemouth for more than 50 years.

MEASURING LARGE FLOWS OF WATER

A group of three articles upon the application of the Venturi principle to specific problems

✦

Flow in Silt-Laden Canal Gaged by Contracted Flume

By R. L. PARSHALL
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DEVELOPMENT WORK for the new type of water-measuring structure described in this article was carried out under the direction of the author. Although first termed the "improved Venturi flume," objection was frequently made to this name on the ground that the device is not, strictly speaking, a Venturi flume. Accordingly, a change in nomenclature to the "Parshall measuring flume" was suggested to and approved by the committee on irrigation hydraulics of the American Society of Civil Engineers. This action has been concurred in by S. H. McCrory, chief, and W. McLaughlin, associate chief, of the division of agricultural engineering, U. S. Department of Agriculture, and by C. A. Lory, president of the Colorado Agricultural College.—EDITOR.

BULLETIN 336 of the Colorado agricultural experiment station, entitled "The Improved Venturi Flume," gives an account of the development of a measuring device for open channels, which possesses the characteristics of accuracy of measurement, freedom from trouble due to silt or sand, and ability to withstand a high degree of submergence without affecting the free-flow rate of discharge. This development work was done at the hydraulic laboratories of the station in Fort Collins, in cooperation with the division of agricultural engineering of the U. S. Department of Agriculture. Laboratory facilities limited flume studies to a maximum size of 8 ft.; for data on larger units it was necessary to resort to actual field installations. Subsequent construction and study of flumes with throat widths varying from 10 to 40 ft. indicate that the general law of free flow for larger sizes is similar in form to that determined in the laboratory for smaller flumes.

The largest unit of this type yet constructed is a 40-ft. reinforced-concrete measuring flume located about 1½ miles below the head of the Fort Lyon Canal near La Junta, Colo. This channel, which serves an area of 96,000 acres, is 75 ft. wide at the bottom, 7 ft. deep, and has a capacity of about 1,800 sec.-ft. The water, taken from the Arkansas River, carries excessive amounts of silt and sand, resulting in deposits in the canal, which render the ordinary type of rating flume entirely unsuitable.

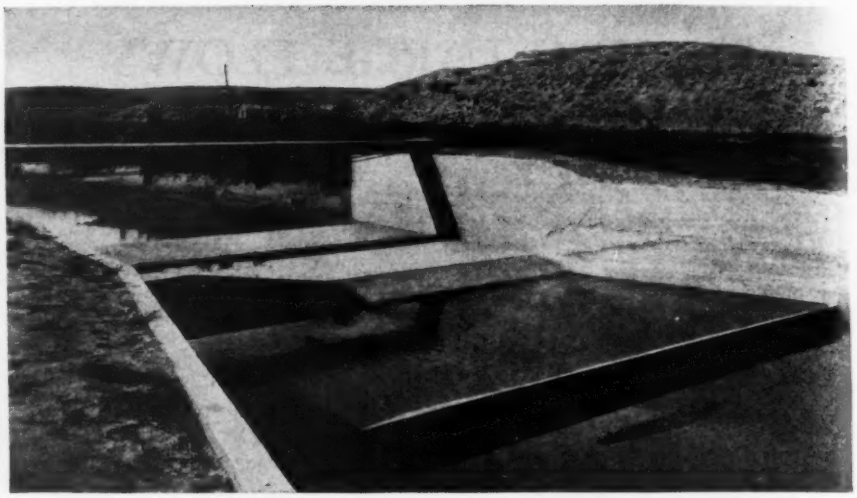
Construction details of the 40-ft. measuring flume are illustrated in the drawing reproduced herewith. It contains 215 cu.yd. of reinforced concrete and costs approximately $6,300. Transverse and longitudinal beams, cast monolithically with the floor, constitute the base of the structure, which is founded upon a deposit of fine sand in the channel. To prevent uplift on the base, one or more short tubes 2½ in. in diameter are cast in the floor in each panel. A 16-ft. planked apron abuts on the downstream end of the concrete.

Water-level readings, denoted H_a and H_b, are taken in two gage wells located in the gage house. To prevent the accumulation of silt, a system of pipes for flushing has been provided. From a point on the upstream entrance well a 6-in. pipe leads to the H_a gage well. A $\frac{3}{16}$-in. steel diaphragm with attached 6-in. gate valve separates the H_a and H_b compartments. A 6-in. pipe leads from the H_b gage well to the throat section at the point of minimum elevation. The hydrostatic head available between the entrance and the throat of structure is sufficient to provide ample water for flushing.

The static head in the H_a gage well indicates the water

Hydraulic conditions in flume during discharges of 175 and 1,390 sec.-ft.

depth in the flume at a point 16 ft. from the crest. This is two-thirds of the distance back from the crest, measured along the converging wall. Four 1½-in. tubes, set in a vertical plane, provide for the inflow to this well. The static head in the H_b gage well indicates the water-surface elevation at the throat, its water supply being through the 6-in. flushing pipe. A slide valve is provided at the upper end of this pipe for use in the flushing operation. This valve has a ¾-in. hole through the slide near the top of the opening; when the valve is closed this hole serves as a damper to the pulsations communicated to the H_b gage well from the surge effect in the throat section of the measuring flume.

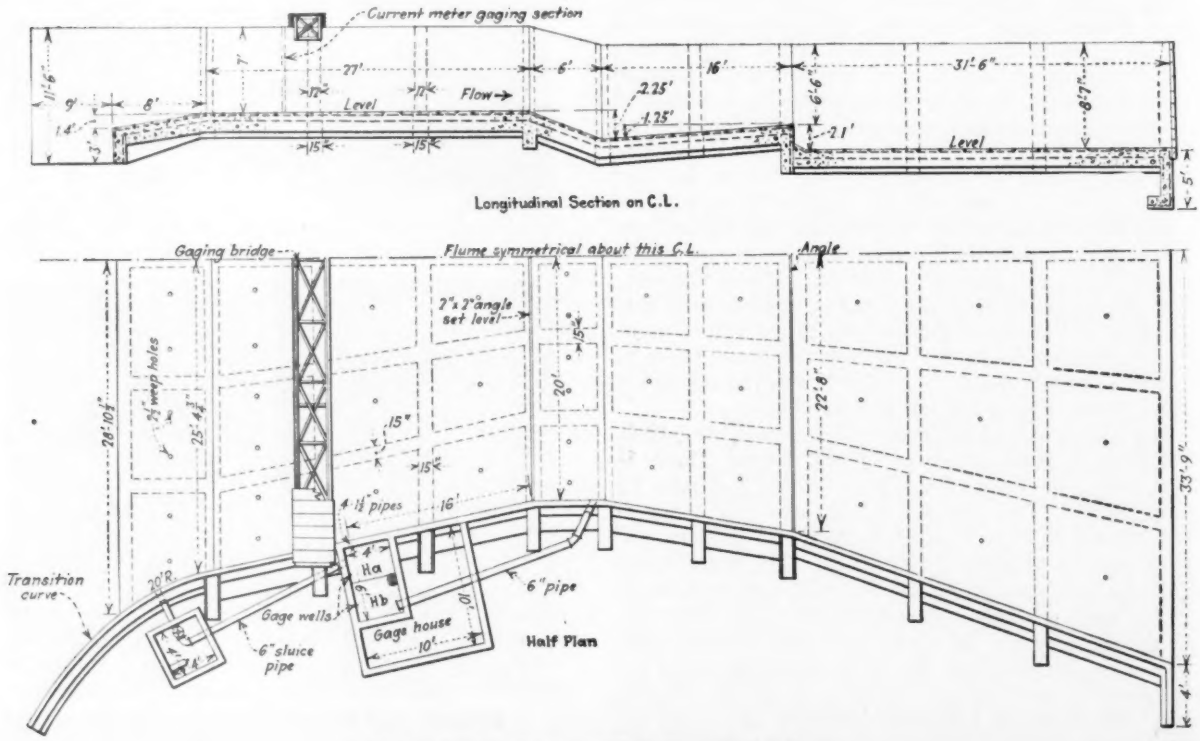


40-ft. Parshall flume at La Junta, Colo.

Another important feature of the installation is the method of indicating the gage heights, or the values of the effective heads H_a and H_b, and also the indication of the rate of flow. On a suitable built-in cabinet over the wells are fixed two broad-faced wheels with pivot bearing. For the H_a gage, a brass ribbon tape 2¼ in. wide is passed over the wheel. This tape is graduated along one edge in feet, tenths and hundredths, and along the opposite edge are marked units of discharge in second-feet. A similar tape 1¼ in. wide, graduated along one edge only in feet, tenths and hundredths, is provided for the H_b gage. Each of these tapes has a 6-in. ball float at one end and a counterweight at the other. Fixed to the base plates of the wheels are vertical posts with horizontal indexes or pointers long enough to reach over the lines of graduation on the tapes. For the H_a gage two pointers are provided—one for the gage height and the other for the discharge, change of stage being indicated by the movement of the tape beneath the pointer. No staff gages are used.

Operating Results

In designing the 40-ft. flume, it was necessary to base conclusions upon the knowledge and experience gained in the study of the 10-, 12-, and 20-ft. flumes already in commission. It was found for the 20-ft.



Design details of largest Parshall measuring flume

flume, having a capacity of 1,000 sec.-ft. that the ratio of the gage heights, H_b/H_a, could reach 80 per cent without affecting the free-flow rate of discharge. For the 40-ft. flume no submerged-flow data have been obtained. Observations show that for discharges from 130 to 1,700 sec.-ft. no submerged flow exceeding 60 per cent has occurred, excepting that caused by ice gorging in the channel. Conditions of flow for discharges of 175 and 1,390 sec.-ft. are illustrated.

By means of extrapolation the formula $Q = 150\ H_a^{1.6}$ was determined at the time of designing the structure as the most probable free-flow law for this 40-ft. flume, where Q is the rate of discharge in second-feet and H_a the depth or stage observed in the gage well at a point two-thirds of the distance back from the crest. Since the completion of this structure 21 current-meter gagings have been made for comparison with the discharges computed by means of this formula. The gaging section is located in the converging section where the distance between walls is 50 ft. A bridge is provided to facilitate work with the current-meter. The point method of gaging was used and velocities determined at 2-ft. intervals, with one exception. Observations show the velocities to be very evenly distributed; for a discharge of 1,390 sec.-ft. a maximum velocity of 8.13 ft. per second was observed. Comparison of observed and computed discharges for flows from 128 to 1,464 sec.-ft. shows a maximum deviation of 2.3 per cent. Of the 21 observations 11 show the computed value to be more than that observed, and 10 less.

Because of the apparently successful operation of all Parshall measuring flumes now in use, especially those in the Arkansas valley, where sand and silt deposit in canals is a serious factor from the standpoint of accurate measurement, it is expected that several other large flumes will be installed within the near future.

This 40-ft. flume was designed at the office of irrigation investigations, Colorado agricultural experiment station, Fort Collins, and constructed under the supervision of Harry Amsley, superintendent of the Fort Lyon Canal Co., and H. W. Alexander, resident engineer, by G. A. Dahlgren, contractor.

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Determining Coefficients for Large Venturi Meters

By S. F. COGHLAN

Assistant Mechanical Designing Engineer, Southern California Edison Co., Los Angeles

CALIBRATION of 26 Venturi meters ranging from 30 to 72 in. in diameter recently was completed on the hydro-electric system of the Southern California Edison Co. in a series of accurate tests when discharge records using standard coefficients showed inconsistencies. The installation of these meters followed the adoption of a policy to keep accurate water records at the company's major hydro-electric plants and, in addition, provide automatic flow control in excess of fixed quantities. Because of the large size of the meters and the fact that they differ from standard proportions in several instances, it was decided to determine the individual coefficients by accurate flow tests rather than to continue to use standard coefficients which are applicable primarily to smaller size meters. The tests were made by means of the salt-velocity method and the results are outlined in the following.

Those meters which had been installed to give accurate water-flow records at the plant were located in penstocks ranging in size from 36 to 78 in. in diameter. The characteristics of the fourteen meters in this series are tabulated in Fig. 1, which also indicates the results of calibrating these meters for a value of C through a range of velocities.

All of these fourteen meters had been carefully constructed and installed; the throats are bronze lined and accurately finished. With the exception of meters 9 and 10, which were formed of seamless steel pipe bored to size, the construction consisted of steel plate cones attached to cast throat sections. Each entrance and throat piezometer belt has four pressure connections 90 deg. apart. These connections at the throat are located at the midpoint along the straight bore.

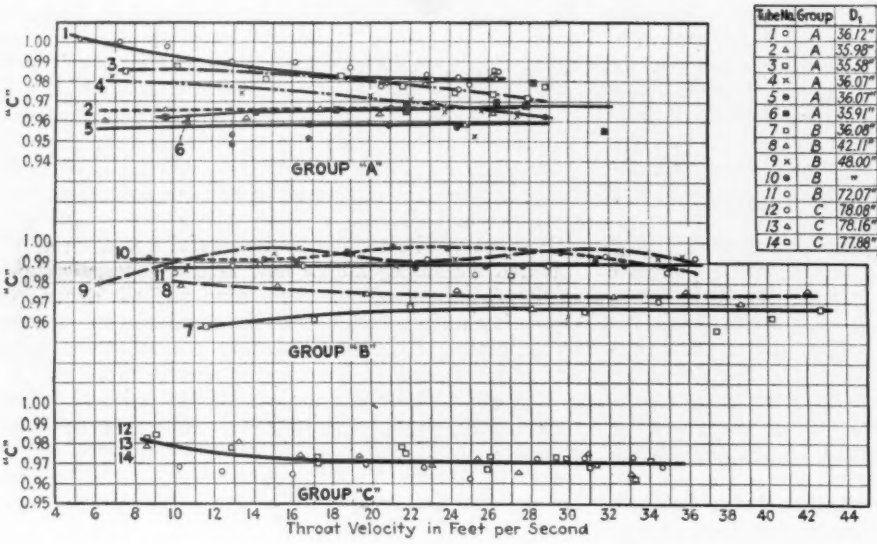
With the exception of Nos. 9 and 10, the meters are located below several hundred feet of straight pipe. The locations of meters 9 and 10 are shown in Fig. 1, and when No. 9 was tested a temporary elbow was located as indicated about 75 ft. upstream. No. 10 was tested after the Y-branch had replaced the elbow and while no flow existed in the other branch of the pipe.

The second series of meters tested, Nos. 15 to 26, inclusive, whose characteristics are tabulated in Fig. 2, were installed for the purpose of securing automatic valve closing under conditions of excess flow caused by a broken penstock. They have hydraulic characteristics inferior to meters 1 to 14. Steel plate construction was used throughout, the cones having countersunk rivets with a circumferential butt strap forming the throat of the tube. The joint between entrance and throat is an angular change without any transition curve. Two pressure connections are provided at the throat and at the entrance, located 45 deg. on either side of the vertical. These meters are located relatively close to vents, manifolds and valves, as shown by the sketches of the layouts. The results of the tests on these meters are indicated as plotted values of C in Fig. 2.

The measurements of flow were made by the salt-velocity method developed by Prof. C. M. Allen, Worcester Polytechnic Institute, and were used with his permission. The method consists of timing the passage of a small quantity of brine between two points in a pipe line. Timing is recorded electrically with instruments, and the volume is computed from actual measurements of the pipe section.

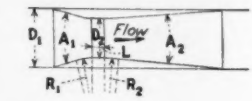
The differential head between throat and inlet connections of the meters was measured with a U-tube mercury manometer. Variation in mercury differentials between low and high flow was from 1 to 20 in. Measurements on the manometer were made with a steel scale reading to hundredths of an inch, and the average of a large number of readings was used for each test.

Wherever possible, actual field measurements of the pipe diameter were made at frequent intervals along the penstocks. In cases where the pipe was completely buried



Tube No.	Group	D_1	D_2	R_1	R_2	L	A_1	A_2
1 ○	A	36.12"	29.50"	38.0"	61.5"	8.5"	21°00'	13°00'
2 △	A	35.98"	"	"	"	"	"	"
3 □	A	35.58"	"	"	"	"	"	"
4 ×	A	36.07"	"	"	"	"	"	"
5 ●	A	36.07"	"	"	"	"	"	"
6 ■	A	35.91"	"	"	"	"	"	"
7 □	B	36.08"	26.00"	"	62.0"	6.5"	"	"
8 △	B	42.11"	33.00"	43.5"	69.0"	8.5"	"	"
9 ×	B	48.00"	40.00"	42.0"	69.0	8.0	"	5°-00'
10 ●	B	"	"	"	"	"	"	"
11 ○	B	72.07"	52.00"	100.0"	100.0"	17.33"	19°50'	"
12 ○	C	78.08"	52.50"	65.0"	106.0"	15.00"	21°00'	13°00'
13 △	C	78.16"	"	"	"	"	"	"
14 □	C	77.86"	"	"	"	"	"	"

VENTURI METER DATA



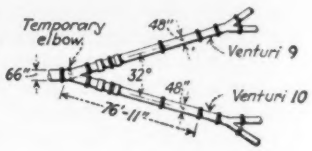


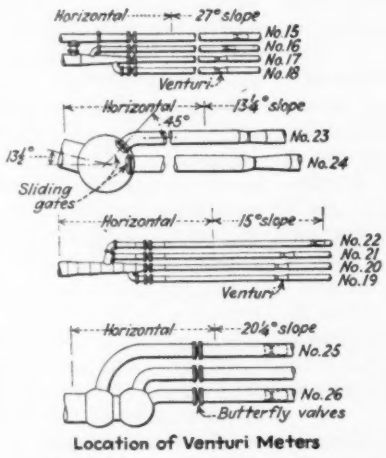
Fig. 1—Dimensions and values of *C* for Venturi meters used for recording water flow

Meters of same size grouped together in plotting results of tests.

the volume was computed from the working drawings of the line. Where dimensions taken from drawings could be checked by actual measurement of the pipe they were found to agree very closely. The writer believes the measurements of flow are accurate to within 0.5 per cent and certainly within less than 1 per cent.

The test for each flow condition consisted of timing at lest four brine injections. The gates or needle valves of the turbine were blocked during such a test to insure steady flow, and the agreement of the recorded times was a check on this factor. Determination of the coefficient was made by the usual formula. Some of the curves indicate an erratic variation for the coefficient, but the values in these cases were proved by check measurements made after an interval of several months.

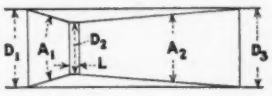
Conclusions—The results of the calibrations indicate that coefficients are more constant for meters with a gradual transition from inlet to throat. In other words, better hydraulic properties shows a more constant value of the coefficient. Caution must be used in applying the coefficient for small standard Venturi meters to large special installations. For all such large installations and in cases of special flow conditions, such as proximity to valves or branches, the discharge coefficient should be determined for each individual case by careful independent discharge measurements.



Location of Venturi Meters

Tube No.	Group	D_1	D_2	D_3	L	A_1	A_2
15 ○	D	44.08	36.00	44.88	6.0	21°46'	7°34"
16 △	"	44.14	"	"	"	21°56'	"
17 □	"	42.11	34.00	42.11	5.4	22°14'	7°52'
18 ×	"	54.14	44.00	54.44	"	21°34'	7°44'
19 ●	"	44.06	36.00	44.88	6	21°44'	7°34'
20 ■	"	44.09	"	"	"	21°48'	"
21 ⊠	"	44.16	"	"	"	21°58'	"
22 ⧓	"	44.59	"	44.66	5.4	22°26'	"
23 ★	"	96.09	76.75	96.12	5.0	21°16'	8°20'
24 ●	"	120.00	87.00	120.00	12.0	20°8'	7°04"
25 ●	"	89.75	72.00	89.81	5.4	23°20'	7°34'
26 +	"	89.28	"	89.51	5.6	20°48'	7°30'

VENTURI METER DATA



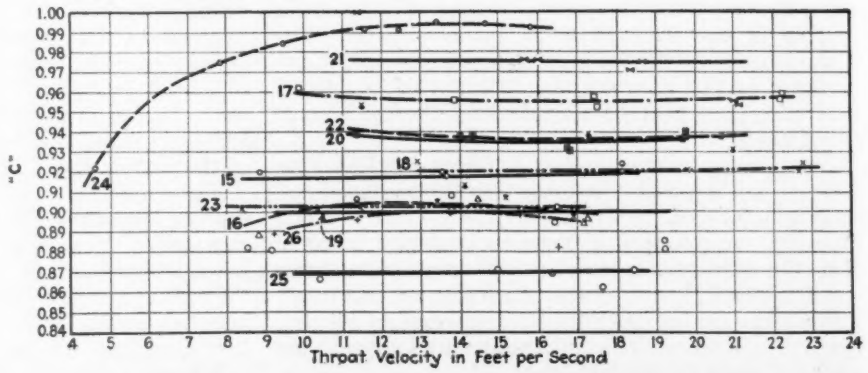


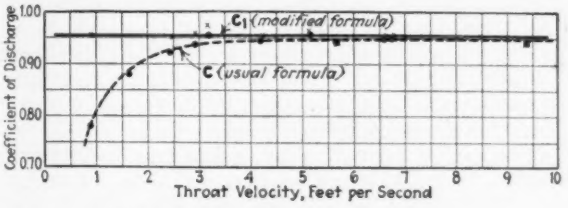
Fig. 2—Dimensions, positions and values of *C* for Venturi meters used for automatic gate control

A Practical Venturi Meter for Irrigation Service

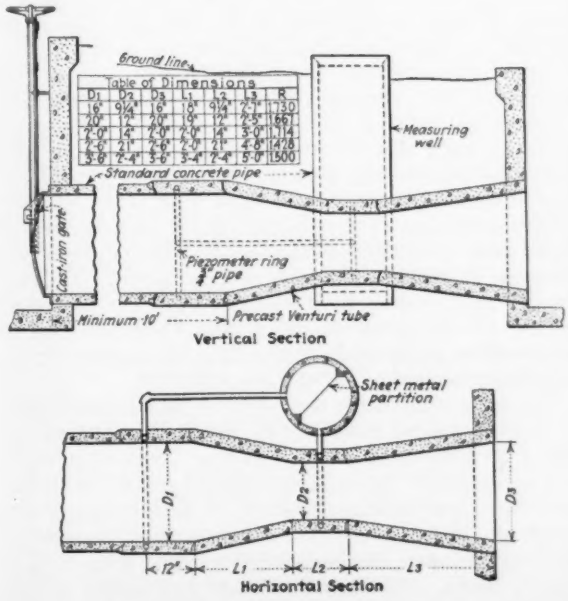
By J. E. CHRISTIANSEN AND I. H. TEILMAN
Junior Irrigation Engineer, University of California, and Chief Engineer, Consolidated Irrigation District, Selma, Calif.

THE adaptation of the Venturi meter to irrigation service at reasonable cost recently has been accomplished in the Consolidated Irrigation District near Fresno, Calif. The development was the result of an effort to eliminate the difficulties common to the usual devices used to measure irrigating water. Built of precast concrete tubes, about 50 meters ranging in size from 16 to 42 in. were placed in service during the 1929-30 irrigating season and were found practical under conditions of actual field use. Calibration tests on the meters in use and on a half-size model at the outdoor hydraulic laboratory of the University of California college of agriculture, located at Davis, Calif., which resulted in a simplification of the ordinary formula, have proved the meters to be sufficiently accurate for this type of service.

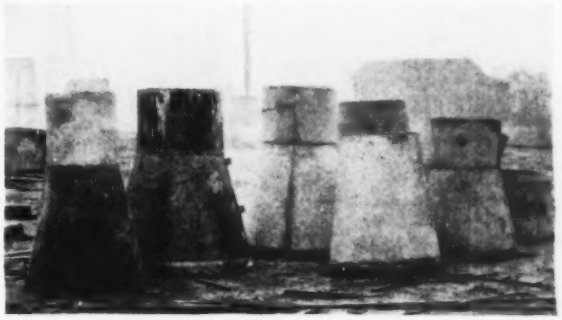
As developed by the district, the meters consist of three sections of precast concrete pipe to form the tube and a vertical well for measuring heads. Beginning at the upstream end, the parts of the meter consist of: (1) a short entrance section of uniform diameter containing the entrance pressure connections; (2) the combined entrance cone and throat sections with the throat piezometer ring, and (3) the exit cone of gradual taper providing a return to the original diameter. The discharge end of the meter consists of a concrete headgate which is constructed as part of the device, but the meters could be inserted as readily in any concrete pipe line.



Discharge coefficient curves for usual and modified formula



Arrangement and dimensions of irrigation Venturi meter



Precast Venturi tubes

The piezometer rings, both at entrance and throat, consist of ½- or ¾-in. iron pipes embedded in the wall of the section with four or five equally spaced ¾-in. holes drilled through the concrete to the inside of the tube. The entrance ring is located 12 in. upstream from the beginning of the cone, and the throat ring is located midway along the throat section. Pipes from these pressure rings are connected to the measuring well formed of a vertical length of concrete pipe. For the small type of meter the measuring well consists of one or two joints of pipe divided by a sheet metal partition. For the larger meters, and especially where deep wells are required, two separate concrete pipes are used as measuring wells.

No recording gages are required for actual measurements, although they may be used if a continuous record is desired. The differential head may be measured accurately with an inexpensive portable hook gage or, for a more convenient means of measurement, a plumb bob and tape may be used. The dimensions and general features of this form of Venturi meter are shown in the accompanying drawing.

The sections are cast in heavy sheet metal forms and are reinforced with ¼-in. bars. Installation of the tube sections is made in a manner similar to installing the same amount of concrete pipe. The actual cost of the meters as built is difficult to determine because they were combined with the district's standard headgate structure. However, the actual Venturi tube itself costs little more than an equal length of plain concrete pipe which it replaces, and the measuring well is generally installed at a cost of about $5.

The elements of these tubes differ slightly from the standard dimensions of this device, necessitating a series of tests to determine the correct discharge coefficient. The 16-, 20- and 24-in. meters were tested against the discharge over a 4-ft. suppressed weir. The head on the weir and the meters were measured with a portable hook gage with readings estimated to 0.001 ft. The tests

RESULTS OF TESTS ON HALF-SIZE MODEL OF IRRIGATION VENTURI METER

Test No.	Weir Discharge, Sec.-Ft.	Venturi Meter: Difference in Head, Ft.	Venturi Meter: Loss in Head, Ft.	Venturi Meter: Throat Velocity, Ft. Per Sec.	Venturi Meter: Coefficient of Discharge, C	Venturi Meter: Coefficient of Discharge, C_1	Venturi Meter: Computed Discharge, Sec.-Ft.	Difference Between Weir and Meter: Sec.-Ft.	Difference Between Weir and Meter: Per Cent
1	0.241	0.018	.....	0.89	0.779	0.954	0.241	.....	.....
2	0.436	0.046	0.013	1.61	0.881	0.944	0.441	+.005	+1.1
3	0.663	0.079	0.023	2.45	0.922	0.952	0.664	+.001	+0.2
4	0.795	0.135	0.026	2.93	0.937	0.959	0.792	—.003	—0.4
5	0.862	0.153	0.031	3.18	0.955	0.974	0.844	—.018	—2.1
6	1.14	0.274	0.052	4.21	0.944	0.954	1.14	.....	.....
7	1.40	0.403	0.076	5.16	0.955	0.963	1.39	—.01	—0.7
8	1.54	0.502	0.094	5.68	0.942	0.948	1.55	+.01	+0.6
9	1.79	0.669	0.124	6.61	0.948	0.953	1.79	.....	.....
10	1.83	0.699	0.125	6.75	0.949	0.953	1.83	.....	.....
11	2.54	1.369	0.247	9.37	0.941	0.943	2.57	+.03	+1.2

showed an average value of 0.960 for the coefficient of discharge. Later tests on the 30-in. meter showed a coefficient value of 0.970. These values were used by the district in computing a table of discharges for the different sizes of meters under various heads, as the results indicated that there was no significant decrease in the value of the coefficient for velocities down to 1.5 ft. per second.

As a further and more accurate test on this measuring device, a model meter of one-half the size of the 24-in. district meter was installed in a 12-in. concrete pipe line at the outdoor hydraulic laboratory of the college of agriculture in November, 1929. This model was constructed of sheet iron with welded joints and was painted both inside and outside with bituminous paint prior to installation.

The pressure connections on this meter consisted of only one tap at each location. The upstream connection was made through the side of the concrete pipe 12 in. from the beginning of the entrance cone. The throat connection consisted of a $\frac{3}{4}$-in. pipe welded around a $\frac{1}{2}$-in. hole drilled in the side of the throat section. To allow a complete calibration of the meter, a third pressure connection similar to the one upstream was made in the pipe line 12 in. from the end of the exit cone to permit a determination of the loss in head.

The tests on this meter were made in comparison with discharge over a 2-ft. rectangular weir, and conditions for making accurate measurements were excellent. A hook gage for measuring the head on both instruments was read to thousandths of a foot. The results of these tests are summarized in the accompanying table, each test representing the mean of from three to six determinations.

The relationship between discharge coefficient and throat velocity was found to be similar to the characteristics of standard Venturi meters. For a throat velocity of more than 3 ft. per second the value of the coefficient remained practically constant but for lower velocities it decreased rapidly. This variation in coefficient makes the usual Venturi meter formula of $Q = CMH$ rather inconvenient for practical irrigation use. The nature of the variation of the coefficient with the throat velocity led to the conclusion that the discharge could be expressed as accurately in a formula of the type $Q = C_1M(H - X)^n$ in which all the terms would be constant.

The new coefficient C_1 is made a constant throughout the range of the meter by the introduction of the new constant X, which appears under the radicle as a deduction from the measuring head, H. The value n is 0.50 theoretically, and tests showed this to be true to the third figure. The test data on the 12-in. meter agreed closely with this type of formula, with the following value for the constants: $C_1 = 0.954$; $M = 2.309$; $X = 0.006$, and $n = 0.50$. The small variation of C_1, with varying throat velocities, is shown in the table. An advantage of the modified formula, especially where a recording water-level register is used, is the possibility of adjusting the instrument to correct automatically for X.

Aluminum Paint on Creosoted Wood

EVER SINCE the preservative treatment of timber with creosote oils came into general use, effort has been made to find a satisfactory paint for wood so treated. Ordinary oil paints soon discolor when applied to the surface of creosoted wood. The problem has been particularly acute for highway departments because it is often found desirable to paint telegraph poles and guard rails of creosoted timber white to make them conspicuous.

Recently experiments have been made with aluminum paint with very satisfactory results, according to the December issue of *Wood Preserving News*. The paints used were as follows: First, a white cellulose base paint; second, a green lead base paint; third, a green zinc base paint; fourth, an aluminum paint.

One coat of each of these paints was applied to a creosoted pole which had been set up in the ground and allowed to dry out for approximately three weeks before painting. After painting, these poles were allowed to stand exposed to the weather and were given frequent inspection. Within 60 to 90 days all of these paints with the exception of the fourth, the aluminum paint, had begun to show some discoloration. An inspection at the end of two years revealed the following conditions:

The white cellulose paint was almost entirely obliterated. The surface of the pole was hard, glass smooth, and mottled like a tortoise shell. The green lead base paint was in better condition, the pole showing a smooth surface, free from cracks, with only streaks of the original color. The green zinc base paint showed a condition similar to that of the green lead base paint. In all three cases the paint formed a smooth dry surface, although the color of the creosote prevailed. The aluminum paint proved most satisfactory. The aluminum did not discolor as in the other three cases and kept its bright silver finish without discoloration, making a very satisfactory covering for the creosote.

The paint used in the test was of a mix recommended by the Aluminum Company of America. The vehicle was a hard dry long oil, varnish type, containing 50 per cent by weight of non-volatile oils and gum. The major portion of the vehicle consisted of heat-treated China wood oil, and the remainder heat-treated linseed oil. This sets to touch in about two hours and dries hard in twelve hours. Aluminum powder was added to this at the rate of $2\frac{1}{4}$ lb. per gallon, the mixing being done on the job as required.

Runways, Taxi Strips and Field Surfaces

By WILBUR G. HUDSON

Recently Vice-President and Chief Engineer, Curtiss-Wright Airports Corp., New York City

Fig. 1—Airport at Valley Stream, Long Island
Runways *(B)* and taxi strip *(C)* constructed by mixed-in-place oil method. Hangar aprons of reinforced concrete. Parking areas *(E)* and area in front of hangar *(D)* sprayed with road oil. *(A)* shows a taxi strip as worn in the sod by plane wheels.

Notes on design and construction, costs and suitability of different types of surfaces used by the owners of the country's largest chain of airports

ONE OF THE most interesting and necessary problems incident to airport construction has been the determination of the most suitable flying-field surface treatment. In the country-wide chain of airports established by the Curtiss-Wright Airports Corp., each unit presented new features calling for special study, and a description of some of the methods followed may be of value to engineers engaged in similar work.

The Dust Problem—In airport work the dust problem is always unpleasantly conspicuous. The neighborhood of the average airport for a radius of 1 or even 2 miles is subjected to this nuisance, and unless it is suppressed, injunctions may tie up operations. The federal court of Northern Ohio, in Swetlands vs. the Ohio Air Terminals, Inc., held that the defendant company "is hereby enjoined from permitting dust from their operations to fly or drift in substantial or annoying quantities over the property of the plaintiffs."

The best dust preventive and, in some respects, the best landing surface, is the all-over grass field. The cost of fertilizing and seeding will average around $100 per acre, or 2.6 cents per square yard. The maintenance cost of a grassed area depends to some extent on the ability of the management to shift operations from time to time, so that the grass may have rest periods. A protracted drought starts the dust flying again, and winter operations churn the soil, so that extensive replanting becomes necessary. Wheat, rye or oats, mixed with clover, gives a quick growth and costs one-tenth as much as grass. However, these seeds must be replanted each year. Data on the relative cost of grass, rye, oats, etc., over a period of years under the conditions of airport operations, will be valuable indeed.

The grasses used should be tough and deep-rooted. Ordinary lawn grass, such as blue grass, sheep's fescue, etc., will not stand up under rough treatment. A landing field with a tough, heavy stand of grass is in many respects ideal under normal conditions. However, the heat and long drought of the past summer created havoc on such fields. Sprinkling, because of the vast areas involved, is expensive. For an area of 100 acres, the equivalent of ½ in. of rainfall calls for 1,100,000 gal., and if this must be pumped weekly for a protracted period, the maintenance expense, in addition to the investment in piping, forms a rather discouraging total.

Hard-Surface Runways—Although a yielding grass surface is to be preferred, it usually is necessary to provide one or more hard-surface runways to permit operations after heavy rains or when the ground is under snow. Again, since the movement of planes is generally along definite routes from the hangars or loading points, hard-surface strips or taxiways are essential, as it is obviously impossible for any growth to stand up under such duty.

In Fig. 1, showing the Curtiss-Wright airport at Valley Stream, Long Island, N. Y., the field treatment is in-

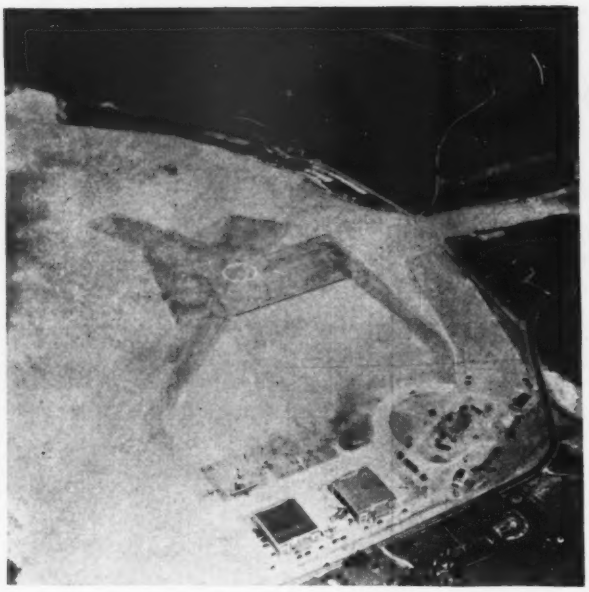


Fig. 2—Bettis Field, McKeesport, Pa.

Field surface of broken shale, rock dust and clay. Runways of tar-treated slag. Only about one-half of runway surface indicated has been constructed.

dicated rather clearly. The soil here is sandy in character. The strip marked *A* shows the track worn through the sod by the continual passage of planes from the field to the hangars. *B-B* are the 125x2,000-ft. runways in the direction of the prevailing winds (S.E. and S.W.). *C* is the taxi strip. Runways and taxi strip are formed by the Glendale method, discussed later. *D*, the area in front of the hangar group, is treated with road oil, as are the parking areas *E-E*, at a cost of 8c. per square yard. Occasional re-oiling is necessary. The hangar aprons and hangar taxiway are of reinforced concrete. The difficulty at *A* was eliminated by a 50-ft. strip of penetration asphalt.

Concrete for taxi strips is very desirable since the maintenance cost is negligible. Penetration asphalt is a serviceable substitute, the relative costs are 2 or 3 to 1. Concrete is not the best material for landing strips except under special circumstances, because of its hardness, which gives insufficient drag to the tail-skids and also rapid skid wear.

In constructing the penetration asphalt taxi strip at Valley Stream the area was graded with a slight crown and spread with 3 in. of cinders, thoroughly rolled. Soft spots were regraded and rolled. Screened gravel (crushed stone not available) was next spread to a depth of 1¼ in. and given an application of special penetration asphalt at the rate of ⅝ gal. per square yard. A second 1¼-in. layer of gravel was spread and treated with penetration asphalt at the rate of ¾ gal. per square yard. Washed pea stone, 20 lb. per square yard, was then spread and rolled with an 8-ton roller. This was treated with ⅜ gal. per square yard. Then a second spreading of pea stone was laid and rolled and treated with ⅜ gal. per square yard. This seal coat was permitted to harden before the final rolling. This method has given an excellent taxi strip, which should stand up indefinitely with very little cost of maintenance. The total quantity of oil is 2⅛ gal. per square yard. The hot asphalt was 150 penetration. Gravel is somewhat more difficult to work than crushed stone. The total cost was 80c. per square yard.

At Roosevelt Field, Mineola, L. I., hard-surface strips have recently been constructed using 2½ gal. of asphalt emulsion per square yard, with crushed stone and a seal coat of chips. The advantages of emulsified asphalt are that it can be worked in wet weather, is applied cold and penetrates easily. With penetration asphalt there is a saving of 2 to 3c. per gallon and a smaller quantity is needed.

Slag Runways—At Bettis airport, near McKeesport, Pa., (Fig. 2), the graded surface is broken shale, rock dust, and clay. Slag was cheap and the runways were constructed of 2-in. air-cooled slag, spread 3 in. deep and treated with 2 gal. per square yard of tar applied and choked with 4 lb. of slag. This was rolled and then sealed with ½ gal. of tar per square yard. After the second spraying, as many chips (6 lb.) as the oil would hold were swept over the surface. The cost was 63c. per square yard. This construction has stood up well through the past year both winter and summer, although a few blisters have occurred as a result of freezing and thawing of entrained water.

North Beach—An interesting and economical runway treatment has been used at North Beach, L. I., near Flushing, N. Y. (Fig. 3). This flying field has been

Fig. 3—Land and seaplane port at North Beach, New York City

Field surface formed of sand and mud dredged from the adjoining bay. Runways utilize spent oxide, a mixture of wood chips impregnated with iron rust, obtained from a near-by gas works. Most of runways shown dotted are now completed.

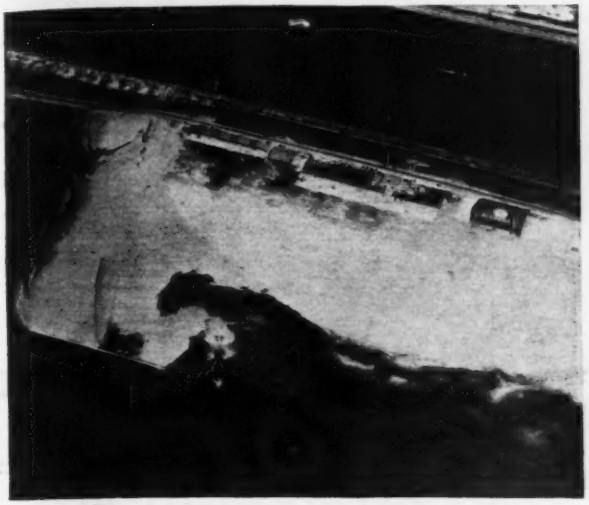


Fig. 4—Alameda airport near San Francisco

Made land surrounded by water. Material is clean sand. First runways of crushed shell proved unsatisfactory. New runways are now being constructed by employing the mixed-in-place oil method

formed of sand and mud dredged from the adjoining bay, although part of the area is from the cut on the inshore side. The airport is primarily for large transport planes and heavy amphibians. Contemplated asphalt-penetration runways would have cost $1.00 per yard, or about $90,000 total, too much for the expected return on the investment. The Astoria gas works was disposing of a considerable yardage of spent "oxide" from its gas purifiers, and it was decided to try this material for runway surfaces. The oxide was delivered without charge and spread over the field area to a depth of 3 in., leveled off and rolled. The results are remarkably good. The oxide consists of wood chips impregnated with iron rust and forms a compact mass, heavy, practically dustless, slightly resilient, and yet soft enough to give the desired drag to the tail-skids. The indications are that these oxide runways will be of practically the same resilience in winter as in summer, except in extreme winter weather; whereas the plastic asphalt-sand method is too soft in hot weather and too hard in winter. The total cost was 7c. per square yard (for spreading and rolling) or a total of $6,300. Any airport so located that gas-house oxide is available may provide runways at a fraction of the cost of any other method.

Alameda, Calif.—Another interesting engineering problem was encountered at Alameda airport, directly across the bay from San Francisco (Fig. 4). The original field area consisted of a narrow strip about 500 ft. wide by 2,500 ft. long, running east and west in the direction of the usual daylight winds. The Southern Pacific Railroad is adjacent to the north and beyond the tracks is the Alameda estuary. The airport site, as leased from the city of Alameda, includes a rectangular area about 3,000x5,000 ft., mostly submerged. The estuary was being dredged to a channel depth of 34 ft., and arrangements were made with the contractor to spread the dredged material (clean sand) over the site. An attempt was made to form a runway on this sand by the use of crushed shell. This proved totally unsuitable. The impact of the planes and dragging tail-skids pulverize the soft shell fragments, with resultant clouds of white dust. No method of correcting this trouble has been found and the shell will eventually be plowed under.

The runways are now being formed by the "Glendale" method, so called because first tried out at Glendale airport (near Los Angeles). This method involves the repeated harrowing and rolling of the sand, at the same time mixing with an asphaltum oil to a depth of 6 or 8 in. until the mass becomes semi-solid, as described in *Engineering News-Record*, April 25, 1929, p. 660. The same method was followed for the two Valley Stream (N.Y.) main runways and taxi strips and is fairly satisfactory and quite economical (60c. per square yard). Both the Valley Stream and the Glendale runways have stood up well so far. In hot weather the Glendale surface tends to become somewhat soft. In cold weather, it is, of course, too hard. However, the greatest activity is during the moderately warm weather when the surface is at its best, easily repaired, waterproof, dustless, and just soft enough for safe landings.

Concrete Runways at East St. Louis—At the Curtiss-Steinberg, airport, East St. Louis, Ill., (Fig. 5), the runway problem was quite different. This is an all-over grass field requiring an extensive drainage system, and since the elevation of the airport is less than the flood-water stage of the near-by Mississippi River, the marginal drainage ditch was dammed at the east corner of the field; two centrifugal pumps operated by 100-hp. motors lift the water over this bulkhead. To some extent the level of water in the marginal drainage ditch controls

Fig. 5—Airport at East St. Louis, Ill.

Field surface of gumbo requires extensive drainage system. Three reinforced-concrete runways 100 ft. wide by 1,600 ft. long are in service.

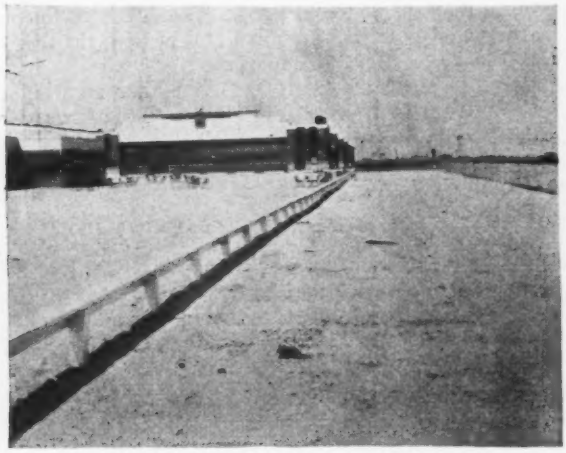


Fig. 6—Public space at East St. Louis

Water-bound crushed stone and screening are used at this airport for the parking area and footwalks.

Fig. 7—Airport site at Milwaukee, Wis.

Construction not yet begun. Conditions favor an all-over grass field, namely, well-fertilized and flat farm land.

the runoff rate and the water table in such a way as to irrigate the grassed areas.

Although this airport is thoroughly drained, the character of the gumbo soil is such that it is extremely soft when saturated. None of the methods of runway construction heretofore described would be feasible, and so concrete was decided upon. This is primarily a transport field, and the field area must be safe for landings and take-offs under any weather conditions. Three runways each 100x1,600 ft., giving six take-off directions, were provided. These are of 1:2:4 mix, heavily reinforced with wire mesh, and a thickness of 6 in. and expansion joints placed every 30 ft. The aprons and taxi strips are of similar construction. The runways cost $3.25 per square yard. This figure is high, as the work was carried on through bad weather, frequently under conditions which made it necessary to heat the water and aggregate. Had the work been carried through in temperate weather the cost would have been about $2.25 per square yard.

Parking Areas and Walks—A substantial percentage of the income at any airport is derived from the admission and parking charges. Large parking areas, if not of too costly construction, show good return on the investment. If there are sandy-soil conditions, two or three applications of road oil on a crowned surface with marginal tile drains or marginal stone-filled trenches, give satisfactory results at a cost of 8 or 9c. per square yard. This treatment gives unpleasant results at first, as the oil practically ruins footwear, but after a short period this trouble disappears.

A more substantial construction may be provided under soft-soil conditions by a layer of 2 or 3 in. of stone dust covered with 3 in. or more of crushed stone compacted with a light roller. The dust acts as a stiffener or coagulent with the soft under-soil and prevents the stone top dressing from mixing in it. This same construction may be used for footwalks. An alternate is a water-bound 3-in. layer of 1½- to 2½-in. stone, rolled, with the voids filled with screenings. This costs about 30c. per square yard.

These last-discussed methods for parking areas and walks were followed at Curtiss-Steinberg (Fig 6) with satisfactory results. It will be noted that a promenade about 20 ft. wide is located between the field boundary fence and the parking area, with a barrier to prevent autos from encroaching on the promenade. This gives opportunity for much larger crowds than if the autos line up against the fences.

In the various unit-cost figures given, only labor and materials and not superintendance, overhead, and plant have been included. Conditions in airport construction have changed greatly in the last year. More attention must be paid to the investment as regards the probable eventual return. The impressive picture drawings of magnificent airports will go no farther than pictures for some time to come. The average airport property carries a heavy burden of interest on the investment, maintenance charges, etc., and every possible effort must be made to keep the development costs at a minimum. The requirements as to hangar space, length of runways, field areas, etc., may change radically. The interpretation of the laws relating to trespass and nuisance may modify seriously the conditions under which airports may operate. The science at present is scarcely beyond the initial stage. The engineer must build for the immediate requirements, since he cannot know the changes just ahead.

Strength of Wood From Dead Trees

The requirement that timbers, piles and poles should be cut from live trees, as included in many modern specifications, is unnecessary and uneconomical, according to studies made by the U. S. Forest Products Laboratory and reported by R. P. A. Johnson. Such a clause does exclude all unsatisfactory material, as timber left in the woods for a considerable time may be damaged seriously by decay, checking or insects. On the other hand, much good material may not be utilized, as in the case of sound but blight-killed trees left uncut by reason of the "live tree" clause. It is also difficult to enforce this requirement, since there is said to be no means of definitely distinguishing timber cut from live trees. Tests indicate that there is no difference in strength of poles or structural timbers cut from live trees and fire-killed trees and that their strength is affected rather by defects. As a general conclusion it appears that sound wood from trees killed by fire, wind or bark diseases is as strong as wood from green trees.

What Has Happened to Building Costs?

Survey by prominent New York contractor shows that present cost of building construction, 20 per cent lower than in 1925, is in line with reduced prices of commodities

By WM. JOSHUA BARNEY
President, Barney-Ahlers Construction Corp., New York City

WHAT is the present cost of building construction in relation to the current prices of commodities? Have building costs kept pace with other prices in the recent downward trend? What is the trend of labor costs in view of increasing efficiency? Answers to these questions are of utmost importance in the light of the emphasis being placed on construction as a means of stimulating general business. It seems essential to make a frank examination as to how far the building industry has conformed to the requirements of the time in relation to the general lessening of costs for other articles.

A study of a limited field—building construction in the New York metropolitan district—indicates that present building costs have followed the downward trend in prices to the extent of a weighted average of 20 per cent below 1925 costs. Any comparison of construction costs is difficult because of varying conditions on every piece of work. In an attempt to arrive at some basis for comparison the principal or typical subdivisions of a building were selected, such as masonry (brick or tile work), plumbing, painting, elevators, plastering, electric wiring, structural-steel frame, reinforced-concrete frame, doors, heating, piles, excavation, roofing and sheet metal. Forty-four builders or contractors, specializing in these various parts of building construction, were asked to go over their cost records and select three pieces of work as nearly identical as possible, one approximately in 1925, the second in 1927 and the third in 1930, limiting their cost comparisons to the particular kind of work in which they specialize. They were requested to present comparative costs, in the form of a table, using the costs of 1925 as 100 or base, on labor cost, material cost, total cost and scale of wages.

Cost of Similar Buildings Compared

The following statement of the factors of comparison on concrete frame, prepared by A. T. Glassett, assistant secretary of the writer's company, formed the inception of the discussion and accompanied the inquiry.

The Barney-Ahlers Construction Corp. for a number of years has been erecting furniture-storage warehouses, which, for operating reasons, are nearly identical in size, equipment and architectural treatment. Moreover, their locations are strikingly similar, so that working conditions governing construction costs are practically identical. For the purpose of comparative cost data the company selected three such similar buildings, one erected in 1925, one in 1927 and one just completed in 1930—all erected in New York during summer seasons. Furthermore, the construction conditions were so similar that it would be exceedingly difficult to obtain a truer base of comparison. On two of the operations the same superintendent was in charge, with practically the same field organization of foremen. Moreover, except for the rates of wages, practically the same labor agreements were in force governing working conditions. All three operations were under the same architect, assuring similarity of standards in workmanship. In order to obtain comparative-cost data that would really be accurate, this search was confined to the placing of concrete structure or framework, or only to work done directly by the company's own organization.

Efficiency Reduces Labor Costs

Replies to our inquiry were sufficient to form the basis of interesting inferences in respect to the trend of building cost. Emphatic warning, is, of course, in order against generalizing about such local and limited data, but the important inferences to be gained from so small a glimpse of changes in building costs most decidedly warrant a prompt collection of a large number of similar analyses in different localities.

The first inference is rather startling. In spite of increases in the rates of wages during the past five years of 25 to 30 per cent for the principal trades, there has apparently been a decrease in labor cost, principally in the last two years, ranging from 10 per cent to as high as 20 per cent. In other words, labor efficiency or productivity has increased from 20 to 40 per cent in this period. Unfortunately, in such a brief survey there is no time nor place for a discussion of the causes of these remarkable figures—how far such results had been produced by fear of unemployment, by better managerial efficiency, increased mechanization and more scientific methods in procedure.

Materials are the second important element. These show a decrease ranging from 5 to 25 per cent, again occurring largely in the last part of the period under consideration. It is only fair to note, however, that the lowest percentage of decrease, 5 per cent, is undoubtedly affected by local market conditions in the metropolitan district of New York. Also, owing to trade conditions, the prices of certain manufactured materials have not decreased proportionately. But building materials on the whole have indicated drops ranging from 10 to 25 per cent, the higher percentages being applicable to the principal items of building construction.

Summing the total cost of labor and materials, the replies indicate that there has been an average decrease of between 15 and 25 per cent in the principal items

entering into the construction of a building. The smaller percentages are reported for some minor items and for the one element affected by local market conditions. Some of these items indicate that in highly specialized trades prices have not receded as much as in the major items of the structural elements.

While not requested to tabulate the comparative margin of profits, a sufficient number of contractors included statements on this point to make it plain that most builders and contractors today are operating on a very narrow margin, if any, of profit, indicating that in this respect building costs have decreased from 5 to 10 per cent; probably considerably more, when there is taken into consideration the reduction of profit not only on the general contract but on each separate part thereon.

All Elements Show Reduction

The decreases gathered from these replies may be summarized for the principal items of cost in a building as follows:

DECREASES IN BUILDING COST FROM 1925 TO DATE

Item	Per Cent Decrease
Excavation	40.0
Piles	10.0
Steel frame	24.6
Concrete frame	9.4
Brick and tile	24.3
Heating	10.0
Electrical	25.0
Plumbing	15.0
Elevators	15.0
Painting	10.0
Roofing	23.0
Doors	4.5
Profits	5.1

Applying these decreases to the quantities of different classes of work in buildings of various types, a fairly accurate trend is established for general building cost. *Such a weighting of the building dollar* shows *that the present cost is 80.35 per cent.* In other words, building costs today are 20 per cent below 1925 costs.

Any such general statement may unquestionably be attacked from the personal experience of many buyers of buildings. Many firms will be able to compare costs of buildings purchased over this period which will apparently show a considerably less reduction in cost. Expert analysis of such comparisons, however, will undoubtedly reveal variations in equipment, foundations, weather conditions or local labor and material markets, and will serve to emphasize the difficulty and fallacy of attempting to establish building-cost trends on a square-foot or cubic-foot basis. Due to lack of identity in buildings, a sounder basis for comparison lies in intelligent consideration of the trends of the principal elements in the cost of a building, for such comparisons are established on items practically identical over a period of time.

This substantial reduction of 20 per cent definitely places building costs in line with the general price levels of today, as comparison with various price indices will show. In the index published by the U. S. Bureau of Labor, *All Commodity Prices Index,* and in the index issued by Irving Fisher, *Index of Commodity Prices,* the year 1925 shows as a peak year in relation to prices during the subsequent five years. The year 1925 coincides with the commencement of a general decline in commodity prices. The first of these indices indicated an approximately 22 per cent decline in the average of all commodity prices. The second index indicates a decline of approximately 25 per cent for wholesale commodity prices.

From a report recently issued by the Merchant's Association of New York, the statement is made that business indices show a general drop in wholesale prices of 12 to 16 per cent. Clothing prices show a reduction from 6 to 25 per cent. Furniture has been reduced about 20 per cent. Apparently foods are 10 per cent lower.

Thus it is clear that the building industry is fully in step with the march of deflation, and it may reasonably claim a position which should inspire confidence in future construction.

Will Prices Advance?

These observations naturally lead to the query, "Are building prices now going to advance?" Many conditions point to an affirmative answer—that in a comparatively short time building costs will commence to increase.

First, there is the profit situation. As the result of a long general decline in building, accentuated at present by seasonal inactivity, the building industry is working practically on the basis of holding its organizations and equipment, in so far as possible. Spring will bring a resumption of considerable building activity, even if subnormal, and it is inevitable that after the first offering of this business has been absorbed on the present basis there will be a strong tendency to increase profits, not only by contractors, but by material and equipment dealers as well. Even a slight increase in profits will inevitably add from 5 to 10 per cent to the total cost of building work, regardless of any other price factor.

Perhaps the cost element that will change most rapidly with the resumption of building in the spring will be the efficiency of labor. The larger part of building mechanics are highly unionized and occupy a sheltered position under normal conditions. Even a slight lessening in the fear of unemployment will tend to decrease the present extraordinary labor efficiency—not collectively, but rather as the inevitable human reaction to changed conditions. Nor will labor efficiency for a long time recede to the low levels of the labor-scarcity periods of the past decade. But there can be no question as to the likelihood of some increase in building costs in the near future from this cause.

As to materials, there are already unmistakable signs that manufacturers and dealers are striving to place their business upon a profitable basis. This is indicated by recent advances in the prices of steel, gypsum, lumber and brick, and by firm resistance on the part of other materials to any lower price scale.

Therefore, it is easy to visualize that within a comparatively few months building costs will advance from 5 to 10 per cent, going probably higher as business conditions become more normal.

Past Experience a Guide

That a rapid rebound in construction costs is entirely probable is well supported by experience in the last depression period (1921). From a low point early in 1922, construction costs rose progressively by 17 per cent in the short period of fourteen months—an increase that could easily be duplicated under present conditions.

Though these conclusions are based upon a comparatively narrow field of data limited to New York City, they may serve the valuable purpose of stimulating others to make similar inquiries and studies in various localities throughout the country. From a large number of such studies an authoritative composite picture could be set

up of the price trends in the whole building industry. With such an authoritative picture the industry could then present to the buying public definite assurances that buildings are now in the "buying zone" of price levels.

Construction Costs Decrease 18 Per Cent in Two Years

Detroit bids on reservoir construction give a close comparison of cost change from January, 1929

CONTRACT bid prices on two almost identical filtered water reservoirs at Springwells Station, Detroit, show accurately the trend of costs of this type of construction during the past two years. Contract for reservoir No. 1 was let in January, 1929. In December, 1930, contract was let for reservoir No. 2, immediately adjacent to the first and almost identical in every respect. The cost on a comparable basis is 18.5 per cent less than that of the first project.

Because a wall common to both reservoirs was built with the first, some of the quantities in the second job are smaller. In both cases care was taken to eliminate as far as possible uncertainties which might affect the bidding; for example, the city assumed responsibility for length of piles to be purchased and driven.

Comparative bids on the two projects are given in the accompanying table, the bid figures being the average of the lowest five bidders in each case. To arrive at a comparative weighted cost, the engineer's quantities on reservoir No. 1 were used to figure total costs on both jobs. The total reduction of 18½ per cent agrees closely with the reduction in building costs computed for New York City by Wm. Joshua Barney.

	Avg. 5 Low Bids— Jan., 1929	Dec., 1930	Per Cent Change from 1929
Earth excav. and backfill, 17,000 cu.yd.	$0.80	$0.61	—24
Earth excav. placed on site, 10,000 cu.yd.	.55	.52	— 5
Timber piles, 181,760 lin.ft.	.38	.32	—16
Conc. A, 6,230 cu.yd.	12.90	10.53	—18
Conc. B, 1,000 cu.yd.	12.80	9.65	—25
Conc. C, 11,900 cu.yd.	11.20	9.45	—16
Reinf. steel, 2,391,250 lb.	.037	.028	—24
Special castings, 56,000 lb.	.10	.09	—10
Misc. steel and iron, 18,500 lb.	.19	.20	+ 5
Laying 12-in. drain, 1,135 lin.ft.	1.05	.87	—17
12-in. drain, 800 lin.ft.	1.01	.76	—25
6-in. drain, 14,500 lin.ft.	.45	.36	—20
Crushed stone or gravel, 3,000 cu.yd.	3.35	2.43	—28
12-in. sewer, 500 lin.ft.	6.50	2.32	—44
Totals	$433,838	$352,428	—18.5

Shortage of Power Predicted for Ontario

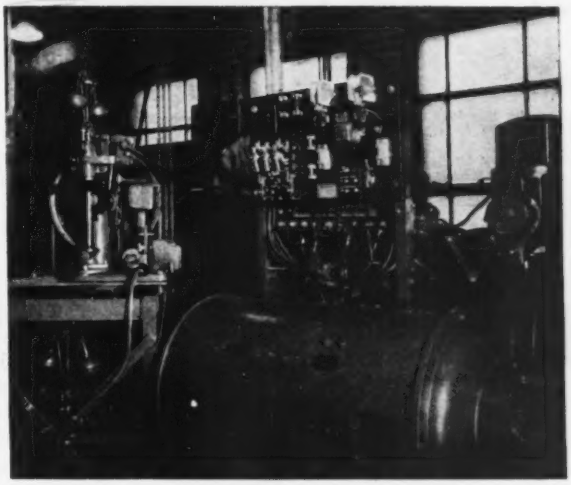
According to a statement issued by F. A. Gaby, chief engineer of the Ontario Hydro Electric Power Commission, the Province of Ontario will be faced with a serious power shortage in four or five years unless additional provisions for power are made immediately, his estimates for future requirements being based on 25 years' operating experience. The main sources of future supply must be the Ottawa and St. Lawrence rivers, but before these are available international interprovincial and other interests must be adjusted.

Dealing with the increasing demand for power, it is pointed out that during the last decade hydro-electric installations have increased by 140 per cent, from 2,515 hp. to 6,125,000 hp. Of this increase 1,787,000 hp. has been developed during the past five years.

Dual Elevator System Placed in Operation at Pittsburgh

Trial installation in Westinghouse Building proves that express and local service in the same shaftway is possible and safe

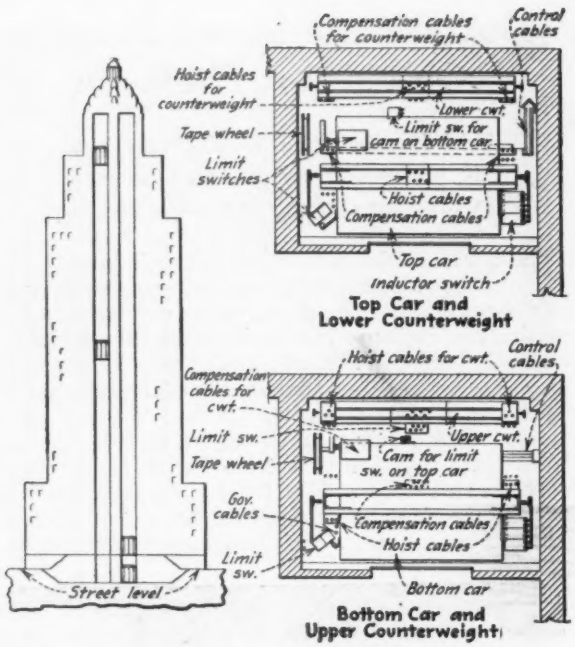
THE FIRST installation where two independent elevators are operated in one shaftway has been put into operation at the south end of the new office building of the Westinghouse Electric & Manufacturing Co. at East Pittsburgh, Pa. Each elevator car will carry 3,000 lb. and travel at 600 ft. per minute. The cars, are full automatic in their operation. In each car is a set of buttons corresponding to the floors served. At each landing are two sets of buttons for calling either the upper or lower car. The top car operates from the third to the eleventh floor and the bottom car from the first to the ninth floor. This initial installation has demonstrated the practicability of extending the system to extremely tall buildings in which the top car would run express to a certain height, serving all floors from this point to the top, while the bottom car would give local service to the floors in the lower half of the building. It also points to the possibility of eliminating entirely or in part those shaftways now devoted exclusively to local service, with a consequent saving in non-revenue-producing floorspace.



Elevator machine and governors for dual car system

Under the Westinghouse system both cars are as unrestricted in their operation as under the single-car system, except that both cars must move in the same direction and that safety devices govern their speed when they approach one another.

The cars are normally operated on a block system of control. As one car approaches the other it is first slowed down and then stopped by means of the same control which is used for its normal operation. The operator in the car has a set of three signal lights which indicate his position relative to the other car. A green light indicates that he can run full speed; an amber light is a cautionary signal requiring half speed; and a red light means stop. In case of an emergency either car may be moved up or down by means of manual control.



Details of dual elevator system

At the left, showing the method of operation, two cars are ready to start up in the right-hand shaft, while in the left shaft the cars have reached their limit of travel and are ready to descend. The two sections of the shaftway at the right show cable connections for both top and bottom car.

Car operation is so timed that both cars will normally reach their upper limits of travel at about the same time, but if the express car arrives at its destination first, it is held there until the local car completes its run and starts downward.

The shaftway details are shown in the accompanying drawing. The two counterweights are operated on the same set of rails. The upper counterweight, attached to the lower car, is provided with a safety to prevent its dropping on the lower in the event that the ropes break. The hoisting cables of the lower car are attached to the outer end of a crossbeam on the roof of the car, feed upward either side of the top car and are attached to the outer ends of the top counterweight. The hoisting ropes for the top car are attached to the center of the crossbeam on the roof of the car and lead to an attachment at the center of the bottom counterweight, reached by passing through a slot in the upper counterweight. The compensating cables from the bottom car are attached to the top counterweight, while the compensating cables for the top car pass down either side of the bottom car and attach to the ends of the bottom counterweight.

Unusual safety precautions have been taken in the design. A set of differential gearing, located at the top of the shaft, is provided with two elements, one of which is attached to each car by means of a steel tape. Automatic devices stop both cars if either steel tape becomes slack. This differential gearing operates to slow down and stop the approaching car if the block system should fail. The action, however, is selective, so that the leading car does not have its control interfered with and thus can clear the block and provide safe running space for the following car. Electrical connections operating on a circuit separate from the normal control circuit, act to reduce the speed of the car. Also when the car territory an emergency stop circuit is set, applying both dynamic and mechanical brakes.

The elevator machinery includes a governor for each car. The differential gearing is so connected to these governors as to reduce the tripping speed of the governor for the approaching car, so that the car safeties will be tripped if the car enters a dangerous position at an unsafe speed. The car safety is an improved design recently placed on the market. It is set by a very small movement of the car after the governor trips. The initial pressure of the jaws against the rail is applied through a spring. A further movement of the car causes the jaws of the emergency brake to grip the rail with increasing force.

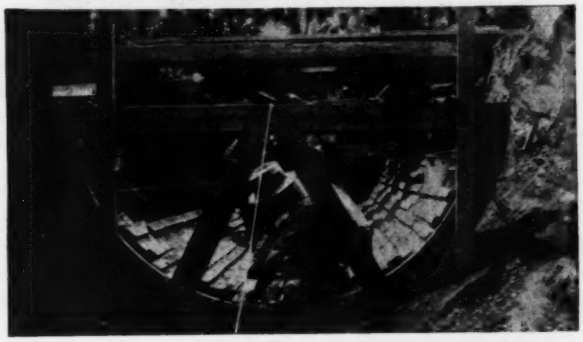
A considerable saving in weight in the trial installation was effected by utilizing aluminum for the car sling and platform framing. In addition, a combination of aluminum and micarta was used for the car inclosure.

Continuous Operation Speeds Work on Segmental Block Sewer

Work subdivided into separate operations which proceed simultaneously — construction progress of 150 ft. per day attained

THE APPLICATION of modern mass-production methods to the construction of a segmental clay-block stormwater drain in the village of Wilmette, Ill., has resulted in a rate of progress of 150 ft. per day, including excavation, timbering, masonry and backfill. The work has been divided into a number of component operations, and a small gang of workmen has been assigned to each.

In the design of Wilmette's new storm-sewer system the laterals drain from the north and south into a main trunk line in Lake Avenue. The water then flows westerly along Lake Ave. to be discharged ultimately into the north branch of the Chicago River. As relative elevations of the sewer system and the water surface in the river preclude a free discharge at this point at all times, a pumping station of 250-sec.-ft. capacity is being constructed about ¼ mile east of the river. The main trunk sewer is being constructed of segmental clay blocks and full lined with vitrified-clay liner plates, which interlock with the segmental blocks. The size of the line



Invert blocks laid in 30-ft. sections, Wilmette storm sewer
Notches formed in blocks provide keyways for liner plates.

varies from 102 to 72 in. internal diameter. The material through which most of the system is laid is the blue clay characteristic of the Chicago region, and no trouble has been experienced with groundwater.

Rough excavation is carried on by a dragline and pull shovel, which remove the material down to a point slightly above the subgrade. The trench, above the elevation of the spring line of the completed sewer, is about 1 ft. wider on each side than it is below that point, forming a shoulder of earth to which the sheeting is driven. Immediately behind the machine there is a gang of workmen engaged in tight-sheeting the trench. The trench as excavated is somewhat larger than is necessary, so that the sheeting slides into place of its own weight. It is supported on the trench side by waling strips and cross struts, and on the bank side by a light waler until the space behind the sheeting is backfilled. A clamshell bucket, trimming the excavation down to a finished subgrade, follows close behind the timbering crew.

Tile Laying—On top of the finished subgrade the next gang deposits a 12-in. layer of a dry mixture of cement, sand and gravel. The profiles, or templets, as set by the engineer are attached to convenient sets of timbering and are utilized by the first gang of masons in setting the segmental blocks for the invert, placing them accurately to line and grade in the dry concrete beneath. The invert blocks are set for a distance of 30 ft. at a time. In the 30-ft. section behind the first mason gang a second gang spreads mortar over the blocks and lays the clay-tile liner plates for the full length of the section, locking them carefully into the keyways that are provided by the blocks. The relation of the liner plates to the segmental blocks is shown in the accompanying illustrations.

Liner plates keyed into segmental blocks

Centering supported on steel rings

Two half circles of steel channel are bolted together at sewer spring line.

Arch liner plates laid over 2-in. lagging

Segmental blocks for top half of sewer are placed after liner plates are laid.

After the liner plates have been completely installed in the invert of a 30-ft. section, centering is erected for the support of the arch of the sewer. This centering consists of a number of 2x6-in. timbers supported by circular rings of steel channel. The rings are made in two halves, the lower half fitting snugly against the finished invert and in turn supporting the upper half of the ring of 2-in. smaller radius. The 2x6-in. lagging, when laid on the upper rings, finishes out smooth at the spring line with the invert liner plates already in place. A 6-in. strip of sheet metal fits over the lagging to keep it in place, and has a bend or stirrup at each end to support the first piece of timber put in place.

The next operation is the placing on this formwork of the liner plates for the arch of the sewer. Directly following the placing of the liner plates comes the completion of the masonry work by the laying of the arch blocks, keyed into the liner plates already in place. The whole completed sewer is then plastered over thoroughly with a coat of cement mortar to give it a smooth and watertight surface.

The backfill is carried along with the progress of the excavation and the masonry work. The dump trucks, receiving the excavation from the steam shovel, have only a short haul down the road, which parallels the line of the work, to the place where backfill is possible. The mortar between the segmental blocks is still green when the backfill is placed, so that the full arch stresses on the sewer will be in force while the mortar is setting. All excess material from the excavation is then hauled away.

The construction of the entire stormwater sewer system is under contract to the Cannel-Conrad Construction Co., of Evanston, Ill. Charles N. Roberts is the engineer for the village.

Annual Meeting of Civil Engineers

Construction, highway, structural, power, and city-planning divisions all hold technical sessions — Division of engineering and finance organized — New officers installed

Engineering News-Record Staff Report

THE 78th annual meeting of the American Society of Civil Engineers, held in New York, Jan. 21-23, maintained the record for sustained interest that characterized last year's convention. A total of 2,200 members and guests was registered. Five technical divisions held sessions.

Honorary membership was conferred on John R. Freeman. Francis Lee Stuart, consulting engineer, New York, was installed as president of the society, succeeding J. F. Coleman of New Orleans. A new division of engineering economics and finance was organized, with Ralph Budd, president of the Great Northern Railway, as chairman, and F. H. McDonald of Atlanta as secretary. At the Thursday evening smoker Roy Chapman Andrews described his adventures of exploration in Central Asia to a packed auditorium. A feature of the afternoon session on Wednesday was a symposium given by the heads of various federal government bureaus, describing their activities as they affect and assist the work of civil engineers.

Committee Reports

The report of the committee on concrete and reinforced-concrete arches, given by Prof. W. M. Wilson of the University of Illinois, recorded the completion of the first stage of the committee's work, namely, model studies of the effect of the superstructure, with and without expansion joints, on the stresses in the rib. Studies with celluloid models showed that where the deck is separated from the rib (on relatively high columns) the presence of expansion joints does not affect materially the temperature stresses in the rib, but that when the deck is monolithic, with the rib near the center of the span, temperature stresses in the rib are considerably increased. The committee laid down the simple rule that expansion joints are not needed when the deck is integral with the rib because they are harmful; but that with high decks, where they are not harmful, expansion joints should be used if required.

The committee on irrigation hydraulics reported upon its activities. Prof. Franklin Thomas, of Pasadena, gave an account of the various partial reports published by members of the committee. Uplift studies have been reported on for the Pardee dam, and similar studies are to be continued at Owyhee and Hoover dams. At the Calderwood dam, scour studies are to be made and correlated with studies of scour, which were made on a model. New apparatus has been developed and will be used in future siphon model studies, which will regulate the atmospheric pressure and permit the results to be translated to full-size siphon operation. Prof. Thomas reported that the committee is planning to study, or has studies under way, on evaporation from reservoirs, evaporation from soils, evaporation losses in canals, water movement under dams, scour under dams, silt problems, and the design of fishways and fish screens.

Committee Report on Windbracing

A committee on windbracing in steel buildings, organized by the Structural Division a year ago, made its first progress report at this meeting. It had directed its studies wholly to high city buildings and considered some of the more urgent of the new problems presented by structures of great height. The report gave a summary of available information on wind force and discussed the participation of walls and floors in wind resistance, distribution of wind force among the several bents, and characteristics of deflection and vibration. The committee includes Prof. C. R. Young (Toronto), N. A. Richards (New York), Prof. F. P. Witmer (Philadelphia), and Prof. C. T. Morris (Columbus).

On the subject of rigidity, the committee's findings represent the first official recognition of the need for limiting the deflection and vibration of a building if it is to be comfortably habitable. It proposed no standard of judgment as to adequate rigidity but remarked that well-designed buildings of 20 to 25 stories having a deflection amounting to 0.004 or 0.005 of their height "have behaved satisfactorily." Its leading recommendations are:

> That the prescribed wind force for buildings for the first 500 ft. of height be a pressure of 20 lb. per sq.ft., and that above this level it be increased at the rate of 2 lb. per sq.ft. for each 100 ft. of height.
>
> That in no member should the stresses due to the combined action of wind and all other loads exceed 75 per cent of the elastic limit of the material, nor should the overturning moment due to wind force exceed two-thirds of the moment of stability due to dead load only.
>
> That in calculations for strength the walls and partitions of a tall building be ignored and the structural frame be required to resist 100 per cent of the recommended wind load.
>
> That the various braced bents passing through a floor be considered as taking wind load only in proportion to their rigidities.
>
> That structural frames be so designed as to insure that deflections and vibrations be kept within such limits as to render buildings comfortably habitable.
>
> That engineers having to do with tall buildings undertake to determine experimentally the actual horizontal movements of buildings of various types and proportions, to the end that means may be devised for predicting the behavior of a building under wind force.
>
> That in the interests of rigidity and economy, deep rather than shallow bracing be employed wherever it is at all practicable.

An interesting series of prepared discussions brought to light a wide range of views on wind pressure, on analysis of framework, and on rigidity and deflection.

D. C. Coyle (New York) emphasized the influence of exposure, pointing out that many high buildings are sheltered by surrounding buildings. He also said that the force of wind gusts is unknown; a duration of 1 to 2 sec. is enough for maximum effect on a high building, but no official records reveal the occurrence or force of such short pulsations. As to variation of wind with height, he holds that a straight-line distribution (increasing continuously from the ground line) would be simpler than that of the committee. H. V. Spurr (New York) also advocated straight-line distribution.

Albert Smith (Chicago) believes the recommended wind force is too small to allow for gust effects at great heights. He suggested a 40-lb. pressure at and above 500 ft., and thence downward a decreasing pressure to 15 lb. at the surface.

Mr. Spurr considered the committee wind force to be too great in the lower stories. Aubrey Weymouth (New York) said that although the observations on wind velocity may be satisfactory, nothing is known about the pressure on high buildings. E. P. Goodrich (New York) expressed the belief that gusts are generally of small area; a 50x50-ft. gust area would be quite large. E. W. Stern (New York) cited data from the St. Louis tornado of 1896, where a pressure of 85 lb. was computed from an overturned stack; he suggested that the committee draft recommendations for tornado districts.

Most of the discussions expressed the view that the report brings out the great lack of actual data on both wind pressure and the behavior of buildings under wind. Prof. George E. Beggs (Princeton) remarked that every existing building constitutes a potential laboratory for obtaining such data, yet nothing has been done. One well-chosen hour of observation may possibly upset the best theories of today.

On the subject of rigidity, deflection limits and vibration, opinions also ranged over a wide field. S. H. Harkness (Toronto) offered the simple solution that we refrain from building too high. He holds that the masonry of a building has much influence on both rigidity and strength, and thinks it proper to disregard wind for so much of the lower part of a building as is adequately stiffened by the walls. Albert Smith suggested that small but rapid vibration may be worse than large but slower vibration; and that the period of a building is perhaps modified by masonry friction and rivet slip. R. Fleming inquired whether the promised measurements of deflection and vibration on the Chrysler Building have been made, but received no answer. D. C. Coyle said that the measure would doubtless be very different for office buildings and apartments, but that the figure of 5 per cent that has been suggested (by H. V. Spurr) as ratio of amplitude to static deflection is probably too great for apartment buildings. He also spoke of the probably large effect of wall stiffness in limiting deflection and vibration, and said that assumptions as to deflection limits may go wrong if the present trend of building design toward elimination of wall masonry continues.

Prof. W. M. Wilson (Illinois) suggested for the committee's future work a study of the influence of connections on the rigidity of a building frame and also fuller study of the rigidity of a bent containing both diagonal and rectangular bracing elements. Albert Smith recommended limiting wind uplift on each column, not merely limiting overturning moment, especially because stiff bracing in inner panels will concentrate the overturning moment on a base much narrower than the width of the building. But with adequate anchorage the weight of foundation piers or caissons should be included in the stability calculation.

R. Fleming criticised all the more advanced systems of wind-stress calculation on the ground that they require two designs, preliminary and final, while the practical designer has time to make only one design.

Two 1,000-Ft. Buildings

Interest in the subject of wind design was maintained in the afternoon by the presentation of papers on the structural features of the Empire State Building and the Manhattan Company Building in New York.

In his paper on the Empire State Building, H. G. Balcom (New York) emphasized the importance of the assistance which the architects, Shreve, Lamb & Harmon, had rendered the structural engineer in arranging floors and service facilities to meet windbracing needs. For the wind design a pressure of 20 lb. per sq.ft. was used above the sixth floor and none below that level. Overturning wind stresses were figured by the cantilever method and the resistance was based on the relative movements of inertia of the different bents. All columns were figured for deflection, and the floor framing was adjusted so that the deflection of each column under the computed load would produce as near equal deflections as practicable.

Mr. Balcom pointed out the difficulty of designing buildings for comfort of occupants in high winds, because of the lack of experimental data. To help correct this fault, he said, plans are being made to install an elaborate series of recording devices in the Empire State Building. The column arrangement is ideal for wind analysis, and the American Institute of Steel Construction's committee, which is conducting the tests, is hoping for more positive results than were obtained from the study of the American Insurance Union Building, in Columbus, whose ratio of height to width was not great enough to permit accurate measurement of wind effects.

Mr. Balcom also described some measurements which are being taken to determine how much steel columns shorten under load. Measurements on the Empire State Building have proceeded to a point where it has been found that the 85th floor is 6¼ in. lower than its theoretical elevation, which agrees very closely with the figured shortening of the columns, based on a modulus of elasticity of 29,000,000. A more detailed account of Mr. Balcom's paper will appear in a future issue.

The structural features of the 70-story Manhattan Company Building were presented in an illustrated lecture by H. V. Spurr (New York). In many respects the Manhattan Company Building presented a more difficult task and represents a greater structural and erection achievement than does any building yet built, in the opinion of several members who discussed the papers. On March 15, 1929, architectural and construction plans did not exist, and the site was still occupied by old buildings of considerable height. On Nov. 19, 1929, eight months after the design drawings were started and six and a half months after the start of demolition, the steelwork was practically all in place. The remarkable manner in which the foundations were constructed during the period of demolition of the old buildings and the methods of erecting the steelwork have been described in *Engineering News-Record*, April 24, 1930, p. 691, and May 8, 1930, p. 756.

Unlike the Empire State Building, the Manhattan Company Building did not benefit in its structural design

from helpful cooperation with the architects. The arrangement of the building, as it was given to the structural engineers in preliminary sketches, was inflexible, and the consequent problem of developing a rigid design for a 900-ft. tower building, with the service facilities and their permanent partitions at one side of the tower and with a large open banking room at its base, was a difficult one.

The general intent of the design was to secure in the web system a rigidity equivalent to a shear deflection of 0.001 of the height, with an average wind pressure of 15 lb. per sq.ft. taken in the structural frame. Mr. Spurr stated that the web system is fairly well proportioned to produce this result, as exemplified by the elastic behavior of the structure. The design used a pressure of 30 lb. above the 60th floor, and 20 lb. between the 8th and 60th floors, in determining the horizontal wind shears and the axial column loads. The upper 100 ft. of the building was designed for a local effect of wind pressure of 40 lb. per sq.ft.

D. C. Coyle, who has developed a seismograph for measuring building vibrations, stated that the frequency of vibration of the Manhattan Company Building is about right for the assumptions under which it was designed.

E. E. Seelye (New York) emphasized the importance of balanced stiffness in preventing masonry cracks, pointing out that the stiffness of floor beams must be adjusted according to their moments of inertia, if the assumed cantilever action and distribution of load between bents is to materialize. He also emphasized the necessity of carrying the cantilever to the very base of the columns instead of attempting to transfer wind shear horizontally.

Albert Smith (Chicago) emphasized the fact that the structural design of buildings 900 ft. or more high must be accorded precedence over architectural or any other considerations. He expressed the belief that many architects do not appreciate the serious nature of wind effects on these tall structures and persist in setting up difficult architectural requirements. He suggested that every effort be used to convince architects of the necessity for safe and rigid design in all buildings where wind stress is an important factor.

Prequalification and Gas Taxes

Summarizing the papers and discussions of 1930 on prequalification of contractors, and continuing the discussion of 1929 on the equitable distribution of gasoline taxes and motor vehicle license fees, the Highway Division rounded out with active discussion the second year of its practice in confining its proceedings to a single theme. Reviewing the papers of 1930 on prequalification of contractors, Prof. C. J. Tilden of Yale University launched an active inquiry from the floor as to prequalification procedure. In general, the opinion expressed favored the principle but indicated doubt of any possibility of applying a yardstick of qualification by any form of questionnaire. It was considered that in all cases the contracting agent's judgment must largely determine decision in any particular case and that only empowering laws or ordinances should be set up.

Accepting the principle that motor-vehicle taxes should in no case be diverted from highway uses, the meeting split definitely on the propriety of distributing a portion of these taxes to city street improvement. It was generally agreed that state roads should be continuous through cities, but not that division should go any farther. The discussion was definitely partisan—city officials urging liberal division and state officials opposing any curtailment of rural road funds.

Natural Gas and Water Power

An innovation was introduced into the program of the Power Division in the form of a paper on the uses of natural gas as a fuel in central power stations. Heretofore the division has devoted its attention chiefly to water power and to the structural side of steam power plant construction.

G. I. Rhodes, vice-president of Ford, Bacon & Davis, New York, presented a paper outlining what has been done and what might be expected in the future in the use of natural gas as fuel in central stations.

So far, only one power station of any size uses natural gas exclusively as a source of fuel. That station is near Monroe, La., in the heart of the Monroe gas field. Other large stations, notably the 300,000-kw. Long Beach plant of the Southern California Edison Co. and the 135,000-kw. plant of the New Orleans Public Service, use natural gas if and when it is not being used for other so-called "higher uses." At other times oil or pulverized coal is used. This condition is in line with what Mr. Rhodes expects to see continue in the use of natural gas. Power stations will take it at off-peak times, when it is not required for domestic and other higher uses which can pay a better price than the power companies. Power-plant use alone does not warrant the construction of long pipe lines nor a great increase in their carrying capacity, but where there is a prospective market for "higher uses" the pipe line companies can add materially to the return on their investment by developing the power-station market to even out their seasonal peaks. Mr. Rhodes in his paper gives comparative values of natural gas, oil and Alabama coal as fuel for central stations.

Water Power at Spier Falls—Considerable interest has been aroused in hydro-electric power circles by the enlargement work which has been carried on at Spier Falls on the Hudson River during the past year. The work was described to the Power Division by John P. Hogan, of the firm of Parsons, Klapp, Brinckerhoff & Douglas, consulting engineers on the work, with some additional comment by Eugene E. Halmos, designing engineer of the firm.

The Spier Falls plant is one of the older hydro plants of the East. Construction of the Concklingville reservoir above the plant by the Hudson River Regulating District has brought an increased flow to the plant and has made an increase in its capacity desirable. Limited space in which to build the addition made the use of large units desirable, but large units, on the other hand, complicated the construction problem. The unit finally determined upon for the new addition was larger in physical dimensions than any turbine built heretofore. The Spier Falls runner is 19 ft. 6 in. in diameter, takes a flow of 7,100 sec.-ft. and operates under a head of 82 ft. Its output is 57,000 hp. In physical dimensions it is only slightly larger than the turbines being built for the Dnieper River plant in Russia, which turbines because of their greater head and larger flow will have an output of 85,000 hp.

Toe Erosion Below Dams—Experience of the Aluminum Company of America with erosion at the toe of dams was the subject of a paper by Robert F. Ewald, a hydraulic engineer of that company. His paper dis-

cussed the results obtained in decreasing erosive action by using the hydraulic jump to dissipate the energy of overflow in cushion pools at the toe of overfall dams.

The dams discussed by Mr. Ewald were three on the Yadkin River in North Carolina and one on the Little Tennessee. All are gravity dams of ogee section built on hard and heavy volcanic rock, broken by jointing planes but little affected by weathering. The rock is stable up to velocities of 15 ft. per second but ravels readily at velocities in excess of 25 ft. per second. There are no aprons at any of the dams.

Erosion has occurred at the toe of each of the dams, but the record to date seems to indicate that it is not continuing, that it has now reached a point where the water cushion formed in the eroded channel is sufficient to develop a hydraulic jump without the aid of channel friction. Mr. Ewald showed longitudinal sections of the channels to indicate how the erosion has progressed. In some instances pockets scoured out in early years have been refilled now that the cushion pool is stabilized.

In the discussion, P. F. Kruse (New York) raised the question whether Mr. Ewald's paper was a recommendation for the omission of control structures, and A. E. Steere (New York) asked whether omission of aprons was an economic consideration. In reply Mr. Ewald stated that aprons were not included, as the conditions which he described were anticipated in the design studies and were expected to make them unnecessary. However, he pointed out that these dams are on relatively hard rock, that dams on soft material might need aprons or control works. G. G. Dixon (Youngstown) stated that in building dams on soft material the most important single element in the development of erosion is a lack of symmetry in the channel which results in destructive eddies.

G. L. Parker (Tacoma) stated that much of the rock in the state of Washington is basalt, which while hard enough to withstand the direct attack of water is so fractured that it is eroded by a plucking process. With such rock he does not believe that models can be used successfully in studies of erosion.

Legislation on Dams—An interim report of the division's committee on legislation concerning the construction of dams was presented by L. F. Harza. The committee was formed last year to study existing legislation relating to the control, supervision and construction of dams with the idea that the division might be able to set up model laws for the guidance of state legislatures. In this way the division hopes to be able to forestall the passage of legislation which is too restrictive or unsound. While the committee is not yet ready to submit a complete report, it has reached the conclusion that it should not recommend laws which will be similar to building codes, that such codes could not be made applicable to the wide conditions under which dams must be built without being too conservative. The committee favors instead a system in which some state official such as the state engineer will be empowered to employ experts to pass upon any dam concerning which he is not entirely satisfied as to the adequacy of the structure or its foundations.

Planning for Construction Speed

Construction methods on a railway bridge and on two tall buildings formed the themes of the papers presented before the Construction Division by Wilson T. Ballard, vice-president of the J. E. Greiner Co., Baltimore, and Russell H. Hunter, vice-president and general superintendent of Starrett Brothers and Eken, Inc., New York. A third paper, dealing with handling methods for building materials, was given by G. G. Wheat (Brooklyn).

The bridge treated by Mr. Ballard was the three-span continuous bridge of the Chesapeake & Ohio Railway over the Ohio River at Cincinnati, designed for E-70 loading (*Engineering News-Record*, Nov. 7, 1929, p. 734). In the discussion of Mr. Ballard's paper H. H. Allen (Baltimore) outlined the advantages of the continuous-truss bridge and cited approximate costs for the Cincinnati structure at $1,150,000 for the superstructure and $600,000 for the substructure.

The necessity, in building construction, of rigid adherence to a progress schedule for the various trades was brought out by Mr. Hunter in describing operations on two of New York's tallest structures where speed was a major consideration.

That speed, economy and safety in building construction can be increased by progressive thinking in the field of material handling was the contention of Mr. Wheat in an interesting presentation of past and present procedure in this field. The point was brought out that although manufacturers have made tremendous strides in plant handling and shipping by mechanical means, once the material reaches the job there is a reversion, in most cases, to inefficient handling in small units or even by individual pieces. The successful application of mechanical transport in a few exceptional jobs cited by Mr. Wheat (notably the Empire State Building and the Lackawanna terminal warehouse in Hoboken, N. J.) point the way to more general adoption of these or similar methods by the building trade generally. Much experimental work remains to be done, but it is only by concentrating engineering skill and planning ability on the problem that progress will be made.

City Planning Division

Growing interest in planned urban development was evidenced by a capacity audience at the meeting of the City Planning Division. Two papers were presented: "The Function of the Civil Engineer in City Planning," by Morris Knowles, consulting engineer, Pittsburgh, and "The Plan of the National Capital," by Lieut.-Col. U. S. Grant, 3d, Corps of Engineers, U. S. Army, and director of public buildings and parks, Washington, D. C.

The paper presented by Mr. Knowles concluded a series begun five years ago by John Nolen (Cambridge), the aim of which was to develop the relation of the various professions to city planning. Because the nature of the engineer's work calls for consideration of future requirements he became the first city planner, a position which was lost, in part to other professions because of the engineer's failure to devote sufficient attention to the esthetic side of the subject. However, practical ability to coordinate plans and finances is now bringing the engineer back to a commanding position in city planning, an advantage which he can retain only by full appreciation of the need for full consultation and cooperation with the architect, the landscape designer and the artist.

In discussion, E. P. Goodrich (New York) said that a small increase in the expenditure for most engineering works is sufficient to secure a large gain in esthetic qualities; and that the creator of a city plan must combine the qualities of engineer, artist, sociologist and economist. U. N. Arthur (Pittsburgh) pointed out the need for accurate maps as the basis for all city planning, and

defended the early engineer-planner for his unwillingness to spend money for beauty alone. Public opinion, said Mr. Arthur, must be favorable before increased costs for this purpose can be justified. Gustav Lindenthal (New York) brought out, by letter, the point that a single executive head is necessary for the successful consummation of any plan, and cited several remarkable examples of city improvements in Europe which were paid for entirely by the increase in land values. The most serious bar to successful reconstruction in this country, in his opinion, is the type of real-estate law now in force which permits land speculation, resulting in excessive land costs.

Colonel Grant's paper traced the development of the city of Washington from the preliminary studies by Major L'Enfant down to the present time, and also touched upon existing plans for future improvements and extensions.

Notice was given at the meeting of the election to the division executive committee of C. F. Loweth, chief engineer of the C. M. & St. P. & P. Railroad. Mr. Loweth succeeds W. W. DeBerard, associate editor of *Engineering News-Record*, the retiring member of the committee. E. N. Noyes, consulting engineer, Dallas, has been named chairman of the executive committee for a two-year term. Harold M. Lewis, executive engineer of the Regional Plan of New York and Its Environs, was reelected secretary. In his report of the year's activities Mr. Lewis called attention to the reorganization of the committee on manuals, which is forming a number of subcommittees to deal with such subjects as subdivisions, thoroughfares, a code for underground conduits and subdivision platting. The next meeting of the division will be at Tacoma, Wash., with thoroughfares as the theme subject. It will also convene during the St. Paul meeting in order to hold an additional session in the capital city series.

LETTERS TO THE EDITOR

A Forum for Expression of Views by Engineers and Contractors

✦

Progress in Industry

Sir—The editorial entitled "Hand Against Machine Work" on p. 915 of the issue of Dec. 11, 1930, and some remarks by Virgil Jordan, as quoted in the issue of Jan. 8, 1931, p. 57, seem to be so intimately associated with the idea of progress that the writer feels impelled to inquire as to just what is meant by the term "progress" in an economic sense. If this letter will be published in the *Engineering News-Record* there is a possibility that replies will throw a little light on what appears to be somewhat of a mirage.

In the past year or so the public has been advised of the erection of an automobile-frame plant which operates almost 100 per cent automatically. In other words, it employs a minimum of labor per unit of output. Such a plant may be a remarkable example of mechanization, but it may also be said to have lost its excuse for existence. Possibly the stockholders may derive some pecuniary benefit, but certainly the public does not. It requires very little imagination to picture the ultimate result for an increasing population if industry is to progress along such lines.

There is nothing of intrinsic value in business or industry as things in themselves. Men engage in business and industry to make money, as that is the incentive to do so; but the only real purpose of these two forms of activity is to enable people to earn a living. By "people" is meant the bulk of the wage earners and not a comparatively few. Heavy manual labor is degrading, and the substitution of mechanical means to relieve such labor is good; but where the substitution of machinery is carried to such an extent that employment consists of feeding and watching automatic machinery, then that kind of labor is quite as degrading in a different way as was the case originally.

Fortunately, this process of mechanical evolution will defeat itself in the long run, partly by over-production and partly by decreasing buying power, but the operation of the law of supply and demand is exceedingly painful. We are glibly informed that men are released by machines to other and better pursuits, but the emphasis is on the release. Those released can, in general, only be employed through the development of new industries, and with the mechanization of the latter the problem is getting harder and not easier. The economic structure is becoming top-heavy.

The question of whether or not business and industry are fundamentally sound as conducted in the principal civilized countries is apparently answered in the negative by the growth of radicalism. The only possible way to counter radicalism is to remove, or at least mitigate, the cause of growth. That is not done by throwing men out of work.

Genuine progress is the increase of happiness of the human race in so far as such happiness is achieved through individual efforts. Paternalism through mass production as we know it is not a substitude. The present depression is the logical result of our idea of "progress"; and while matters may better temporarily, the evil will undoubtedly return again.

Glen Ellyn, Ill.,
Jan. 13, 1931.

WM. D. SHIPMAN.

Operating Cost of Passenger Automobiles

Sir—In your issue of Dec. 11, 1930, Fred Lavis comments on automobile-operating costs given in a letter of mine published in your issue of Nov. 6. Since my previous letter was apparently not sufficiently explicit to prevent misunderstanding, please allow me to clarify it.

The figure of $0.0346 per mile derived in my first letter represented that portion of the operating cost of an average *passenger* automobile chargeable to distance traveled on rural highways. It was intended as a comment on W. H. Van Duzer's figure of $0.0957, used in his article in your issue of Sept. 25, 1930.

Mr. Lavis in his letter says: "In the paper on 'Highways as Elements in Transportation,' published in the August *Proceedings* of the American Society of Civil Engineers, the writer shows that, taking only the elements of operating cost referred to by Mr. Young, the cost for average traffic may be taken at 11.5c. per mile, using the items affected by distance."

Referring to this paper we find the "average traffic" was that expected on the New Jersey approach to the Holland Tunnel, and consisted of:

50 per cent heavy trucks (3 ton), per mile..15c.	7.5c.
25 per cent light trucks and buses, per mile..10c.	2.5c.
25 per cent non-commercial vehicles..... 6c.	1.5c.
Average operating costs per mile.....	11.5c.

Obviously, my figure of 3.5c. should have been compared with Mr. Lavis' figure for non-commercial vehicles, 6c.

In average rural traffic both the proportion of heavy trucks and the operating cost for all types will be smaller than in heavy metropolitan traffic. Prof. T. R. Agg has estimated the total cost of operation of passenger automobiles at 6.43c. per mile (*Bulletin* 91, Iowa Engineering Experiment Station). This figure corresponds with the total cost of 7c. given in my previous letter and contains items which must be reduced or eliminated to obtain the cost chargeable to mileage on rural highways.

Cincinnati, Ohio,
Jan. 2, 1931.

T. P. YOUNG

NEWS OF THE WEEK

Governors of 7 States Meet to Combat Unemployment

The governors or the representatives of governors of the seven states of New York, Massachusetts, Rhode Island, New Jersey, Connecticut, Pennsylvania and Ohio met last week in Albany, N. Y., at the call of Governor Roosevelt, of New York, to discuss the unemployment situation. In calling the conference to order Governor Roosevelt declared that the intent of the meeting was not to talk about relief measures for the present unemployment situation, but rather to build machinery for use in a similar situation in the future.

Governor Roosevelt pointed out that while the seven states represented have but 5 per cent of the area of the nation, their population is 32 per cent of that of the United States, they pay 46 per cent of all income taxes, and their taxation represents 63 per cent of all taxes paid in the United States. They contain 49 per cent of all the wage earners, and the wages paid represents 52 per cent of all the wages paid in the United States.

Leo Wolman, member of the President's committee on recent economic changes, pointed out that the $3,500,000,000 expended on public work throughout the country during 1928 and 1929 for public construction gave direct employment to more than 800,000 persons. He advocated the setting up of a plan under which the government and the states would establish a reserve fund for needed public construction which would be expended during periods of business depression.

James D. Craig, actuary of the Metropolitan Insurance Co., declared that his company was willing to undertake the experiment of writing unemployment insurance in a limited way in order to gain actuarial experience upon which to base general rates for complete coverage of all industries. Prof. William Leiserson, of Antioch College, a member of the Ohio State Unemployment Commission, stated that industry instead of society should be compelled by statute to bear the burden of supporting employees while out of work.

No action was taken by the governors, but they will return to their states with recommendations to place before their respective legislatures.

Committees to Aid in Planning Hydraulic Laboratory

Both American Engineering Council and the American Society of Civil Engineers, at their recent meetings, adopted resolutions favoring the development of the projected national hydraulic laboratory on a basis commensurate with the needs of the country. Both organizations also appointed special committees of five members each to render what service they can to the secretary of commerce and to the director of the Bureau of Standards in the work which the bureau now has in hand. The Am.Soc.C.E. committee will include the president of the society.

Last year Congress authorized the construction of a national hydraulic laboratory as a unit of the Bureau of Standards and more recently Congress appropriated funds for that purpose.

Sacramento Sedimentation Basin Reported Near Collapse

Having completed their investigation, the three consulting engineers, H. D. Dewell, of San Francisco; J. W. Ellms, of Cleveland; and R. E. McDonnell of the Burns & McDonnell Engineering Co., Kansas City, who were asked to survey the sedimentation basin of the city of Sacramento's (Calif.) municipal water system, have filed their report. Their major findings are that the present basin is in imminent danger of collapse; that its repair would necessitate closing it down and dewatering it for several months; that even incomplete repairs would cost $80,000 to $100,000; that complete repairs would cost approximately the same as a new basin of twice the capacity of the present one; and that a new one would be necessary before the present one could be repaired, as otherwise residents of Sacramento would have to drink chlorinated, unfiltered and unsedimented river water.

As a result of this report a bond issue of $450,000 is being urged to cover the cost of a new basin.

Test Suit on San Gabriel Dam Bond Issue Is Started

A test suit to determine the right of Los Angeles County, Calif., to use $21,000,000 remaining from the $25,000,000 San Gabriel canyon high dam bond issue for three low dams in the same canyon will be heard by the state supreme court at Los Angeles on

NEW POWER HOUSE ON THE RIVER JORDAN

Wide World Photo.

The new power plant of the Palestine Electric Corp. on the Jordan River in Palestine is shown in the accompanying illustration. The plant is unique in that it is entirely below sea level. The headrace canal elevation is —731.7 and the tailrace is at El. —821.9. Water from the Jordan River is diverted into a reservoir formed in the Yarmouk River valley, whence it is returned to the Jordan through the penstocks and power house here shown. The present installation is two 8,000-hp. hydro-electric units. The project was described in the issue of *Engineering News-Record* of Aug. 30, 1928, p. 321, together with an outline of future development work.

March 3. As part of a planned procedure to establish legality of use of the remaining funds for purposes other than that for which they were voted, Henry W. Wright, chairman of the county board of supervisors, refused to sign $5,000,000 worth of the bonds to be used in preliminary work in connection with the proposed new flood-control projects. Mr. Wright was named defendant in a mandamus suit.

The $25,000,000 bond issue for the San Gabriel canyon dam was voted in 1927. After expenditure of approximately $4,000,000 on the project, the high dam plan was abandoned early last year because of earth faults discovered at the site.

E. C. Eaton, chief engineer of the county flood-control district, has informed the board of supervisors that if the unused balance of the bond issue can be used, three dams, check dams and a spreading ground can be built in San Gabriel canyon which will carry out the original purpose for which the $25,000,000 was voted.

Parker Route Adopted for Colorado Aqueduct

The board of directors of the Metropolitan Water District of Southern California has officially adopted the Parker route for the district's proposed Colorado River aqueduct, in accordance with the recommendations of Frank E. Weymouth, chief engineer, and with the approval of its engineering board of review, composed of Thaddeus Merriman, New York; A. J. Wiley, Boise, Idaho; and Richard R. Lyman, Salt Lake City, Utah. *(Engineering News-Record,* Dec. 25, 1930, p. 1024.)

Mr. Weymouth was instructed by the board to proceed with studies and to make final estimates of cost. The directors also appointed a committee to investigate and report on the probable amount of a bond issue and time of voting.

Valve Bag Makers Restrained From Alleged Unfair Practices

The U. S. department of justice announces that on Jan. 20 a consent decree was entered in the case of the United States vs. Bates Valve Bag Corp., under the Clayton and Sherman anti-trust acts, by the U. S. District Court at Wilmington, Del. In the view of the department, a long-existing monopoly and restraint of trade in the manufacture and sale of valve bags was brought to an end by the entry of this injunction. The St. Regis Paper Co., of New York, was also a defendant in the case.

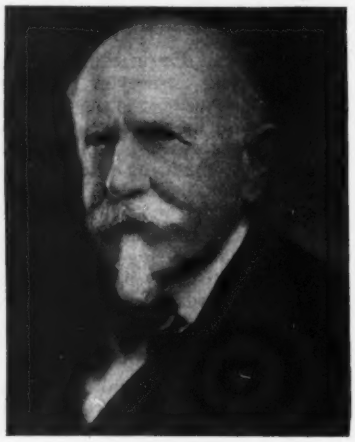
Practically all the cement manufactured and used in the United States is packed in bags of this kind, and it is stated that the total production is more than 700,000,000 per year. The Bates corporation and the St. Regis company were charged in the suit with requiring users of bag-filling machinery leased from them to confine their purchases of bags to the defendant and others named by them on pain of forfeiting the right to the filling machines.

The court entered a perpetual injunction in sweeping terms against the enforcement of the restrictions on bag purchasers as to the sources from which they may supply their needs for bags. The injunction also gives the filling machine users the right to fill bags with the machines obtained from the defendants without regard to the source of purchase.

John R. Freeman—Honorary Member Am.Soc.C.E.

John R. Freeman, internationally known authority on hydraulics, was elected to honorary membership in the American Society of Civil Engineers at its annual meeting held in New York Jan. 24.

Mr. Freeman is a native of West Bridgton, Me., where he was born on July 27, 1865. His early education was obtained in the local district schools and in the public schools of Portland, Me., and Lawrence, Mass. Later he entered Massachusetts Institute of Technology, from which institution he was graduated in 1876. While still a student he began work with the Water Power Co., of Lawrence, and after graduation entered the regular employ of the company. At that time Hiram F. Mills, chief engineer of the company, was engaged in a study of the flow of water, in which work Mr. Freeman acted as his assistant. Here he began to take an active interest in the little-known subject of the factors affecting the flow of water.



John R. Freeman

After ten years of this work Mr. Freeman took employment with the Associated Factory Mutual Fire Insurance Companies as an inspector and hydraulic engineer as a temporary assignment to give him experience in a promising field for hydraulic study, but the work brought out so many interesting problems that he continued with the companies, eventually becoming chief engineer.

Since the opening of this century Mr. Freeman has been devoting himself largely to consulting work on many water supply, water power development, and similar hydraulic subjects, including work on the dams and locks for the Isthmian Canal Commission, the board of review of the Chicago Sanitary District and the Board of Control of Lake Levels.

Mr. Freeman has served as president, vice-president and director of the American Society of Civil Engineers, president of the American Society of Mechanical Engineers and president of the Boston Society of Civil Engineers.

Tunnel Will Eliminate Grade Crossings in Vancouver

The contract for the construction of the tunnel connecting the False Creek and Burrard Inlet yards of the Canadian Pacific Railway at Vancouver has been awarded to the Northern Construction Co., Ltd., and J. W. Stewart, Vancouver. The tunnel, nearly a mile in length, will eliminate grade crossings at five streets in the downtown section of the city, where these streets cross the present C.P.R. spur connecting the False Creek yards and the main trackage along Burrard Inlet. The cost of the work, estimated at $1,750,000, is being borne jointly by the city of Vancouver and the Canadian Pacific Railway, with contributions from the federal government and the British Columbia Electric Railway Co.

Crushed Stone Association in Annual Convention

The National Crushed Stone Association held its fourteenth annual convention in St. Louis on Jan. 19 to 22, with a record registration of more than 600 delegates and guests.

The technical portion of the program included the following papers: "The Economic Feature of the Bituminous Type of Road," by B. E. Gray; "The Applicability of Various Methods for Sewage Disposal," by S. W. Freese; "Ready-Mixed Concrete," by H. F. Thomson; "Researches in the Durability of Concrete," by Harry Gonnerman; "Researches of the National Crushed Stone Association," by A. T. Goldbeck; "Responsibility of the Aggregate Producer as Viewed by the Engineer," by E. R. Kinsey; "What Factors Control the Service Value of Ballast," by J. V. Neubert; "Crusher Bearings, Their Troubles and Remedies," by L. D. Staplin; "The Prevention of Segregation and Breakage in Bins," by Henry Adams; "The Use of Electricity in the Handling of Stone," by J. E. Borland; "The Secondary Road Problem," by Charles M. Upham.

The board of directors voted to increase the research work of the association to more than double its present scope. A. L. Worthen, of the Connecticut Quarries Co., Inc., was elected president for the ensuing year.

W. S. Post Made Director of Irrigation, Indian Service

Secretary of the Interior Wilbur has announced the appointment of William S. Post, of Los Angeles, Calif., as director of irrigation in the Indian Service. This position includes direction of all irrigation activities in the entire service, supplantng the post of chief irrigation engineer, and the appointment is in line with the policy of Secretary Wilbur to coordinate the various activities of the service under an expert technical director with full authority in their field and administrative matters.

Mr. Post has been identified with hydraulic engineering in California and adjoining states for many years. His first government service was with the topographic branch of the U. S. Geological Survey in the West and Alaska. In private practice he was identified with intensive water development in San Diego County, Calif., resulting in a threefold increase of the irrigated area. As constructing or consulting engineer he has been engaged principally on power and irrigation works, reporting on irrigation projects and designing dams.

He was one of three principal assistants to the state engineer of California in a three-year study of the water resources of the state. In this capacity he was charged with the ascertainment of all the reservoir sites in California. The findings of this survey were in part the basis of a "coordinated plan," a state-wide program for the legislature under which it is planned to foster an orderly water development instead of the haphazard methods of pioneer days. Mr. Post comes to the Indian Service from supervising the construction of the Calaveras Dam for the city of Stockton, Calif., completed late in 1930. He is an associate member of the American Society of Civil Engineers.

Consulting Engineers Discuss Expert Testimony

Discussion of expert testimony by the American Institute of Consulting Engineers at its annual meeting Jan. 19 resulted in wide divergence of views on the practicability of bettering trial procedure in respect to expert witnesses. President F. A. Molitor recalled that the subject had been considered by the institute twenty years ago, during its first year of existence, but that no constructive result had been reached then or later. The present discussion was based on the report of a committee, headed by Lewis B. Stillwell, which had considered, among various proposed improvements in procedure, the appointment of expert witnesses by the court. The committee did not favor the proposal, and in discussion at the meeting it appeared that views on court appointment diverged sharply. No action was taken on the report.

Three years ago the institute added to its code of ethics the following section: [It shall be considered unprofessional] "to adopt, while serving as an expert witness before any court or tribunal, the attitude of an advocate or to express an opinion not founded on adequate knowledge and honest conviction."

The institute elected F. A. Molitor to be president, Robert Spurr Weston vice-president, Philip W. Henry secretary and treasurer, and George E. Beggs, E. F. Wendt and R. R. Rumery members of council.

A.G.C. Opens Convention in San Francisco

The Associated General Contractors opened its twelfth annual convention at San Francisco on Jan. 26 with a total registration of about 500 and expectation of a thousand at the annual banquet. The first two days were devoted to general sessions, features of which were an address on "Railways of Tomorrow," by Paul Shoup, president, Southern Pacific Railroad, and a talk on Hoover Dam by Dr. Elwood Mead, commissioner, U. S. Bureau of Reclamation. The building division and the highway division planned separate sessions on Wednesday. On Thursday general sessions were scheduled for morning and afternoon, at which time reports of committees were to be presented and newly elected officers introduced.

Hydraulic Conditions Unaffected by Niagara Rock Slide

A large section of the face of Niagara Falls on the American side sheared off on Jan. 17 and fell into the gorge. The section of the crest of the cataract which broke off was approximately 290 ft. long and extended 65 ft. back from the edge at the deepest point. As only a small portion of the flow of the river goes over the American falls, this recession of the crest will not make any change in flow conditions above the falls.

Western Pacific Gets All-Rail Entrance to San Francisco

Conditional approval of the Western Pacific Railway's plans for an all-rail entrance into San Francisco has been granted by the Interstate Commerce Commission. Authority to build a new line from Niles to San Francisco, including a bridge over the southern end of San Francisco Bay, has been granted to a subsidiary of the Western Pacific provided it cannot obtain trackage rights over the Southern Pacific's Dumbarton bridge by April 1. At San Francisco the Western Pacific is authorized to obtain one-third control of the line now operated jointly by the Southern Pacific and Santa Fe.

INCREASING THE HEIGHT OF ASWAN DAM

Wide World Photo.

Preliminary work for the raising of the crest of Aswan Dam in Egypt is here shown. To the top of the dam 10½ meters of masonry are to be added and heavy buttresses are to be built against the downstream face. The new masonry on the top of the dam is to be made integral with the existing masonry, but the buttresses are to be separated from it by plates of stainless steel. Details of the proposed work were published in the issue of *Engineering News-Record* of Feb. 14, 1929, p. 278.

California Has Plan to Develop Its Water Resources

Following a comprehensive survey of California water problems, the Federal and State Water Resources Commission (*Engineering News-Record*, Jan. 23, 1930, p. 167) has submitted a report including recommendations for conservation and development of the state's water resources.

Two plans of major importance are presented for immediate consideration. The first proposes that the federal government expend $135,000,000 for dams and reservoirs on the Sacramento River at Kennett, Shasta County, and on the San Joaquin River at Friant, Fresno County, with the state taking over their operation after guaranteeing payment of interest of 3½ per cent or less and repayment of the $135,000,000 principal over a period of 50 years. The second recommends that the state undewrite the $200,000,000 bond issue proposition which is now under consideration by the Metropolitan Water District. This proposed financial backing by the state would assist in solving the present water problem of southern California metropolitan area and its contemplated Colorado River supply.

The commission definitely recommended against the salt water barrier, which has been proposed and studied for years as a possible protection of the rich Sacremento River delta farmlands against the continued encroachment of salt water of San Francisco Bay.

Preliminary steps are being taken for the appointment of a state commission to confer with federal officials at Washington, D. C., regarding the government's participation in this program.

Public Works Plans Exceed Those of 1929-30

This week's estimate of total public works construction in 1929-31 includes road programs for the 48 states. The figures are given below in millions of dollars:

	1929	1930	1931
Municipal	1,785	1,680	1,880
County	565	524	594
State	689	921	1,094
Commissions	17	14	30
Totals	3,056	3,139	3,598

New Power Plant Authorized for Pacific Utility

Authorization has been granted by the California railroad commission to the San Joaquin Light & Power Corporation, the Great Western Power Company of California and the Pacific Gas & Electric Co., with which the first-named companies recently were merged, to construct a 50,000-kw. steam plant at Herndon, on the San Joaquin River about 10 miles north of Fresno, Calif. In addition to the power plant, the construction authorized includes 50 miles of 12-in. gas-transmission line from Kettleman to Herndon, 65 miles of 12-in. and 8-in. gas-transmission line from Fresno to Merced, a new electric substation and a 100-mile, 220-kv. transmission line which will tie in with the P. G. & E. system through a switching station at Bellota. It is expected that these facilities will be in operation early in 1932. The total cost is put at $7,500,000. It is estimated that the new facilities will provide an additional outlet for Kettleman natural gas of 12 to 15 million cubic feet per day.

Civil Engineers Prominent in Asheville, N. C., Government

Robert L. Maynard, who for five years has been assistant city engineer of Asheville, N. C., has been appointed city engineer by the city commissioners.

The new mayor of the city is Harry W. Plummer, a consulting civil and electrical engineer. Harry L. Parker, commissioner of public works, is likewise a consulting civil engineer.

Thus the administration of the government of Asheville is largely in the hands of members of the engineering profession.

Verein Deutscher Ingenieure to Mark 75th Anniversary

The 75th anniversary of the Verein Deutscher Ingenieure will be celebrated at the society's 70th annual meeting in Cologne June 26 to 29. The program includes divisional meetings on marketing and selling, on welding, on internal combustion engines, on coating and painting, on employee training, on machinery in lignite mines, on metallurgy, on turbine engines and on traffic problems.

Branch Line of Northern Alberta Railway Nearly Completed

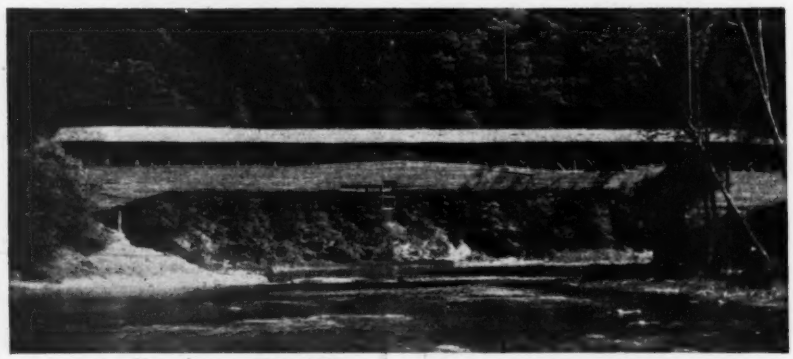
Track laying on the Hythe-Dawson Creek extension of the Northern Alberta Railway has been completed to Pouce Coupe, B. C. The construction of the line, through to its terminus in Dawson Creek, a few miles farther, will mark the completion of a 50-mile branch from Hythe, Alta. This branch line, when finished, will have cost approximately one and three-quarter million dollars. The Northern Alberta Railway is jointly owned by the Canadian National Railways and the Canadian Pacific Railway. The management, it is expected, will shortly apply to the board of railway commissioners for permission to operate freight trains over the new branch line, which is the first to cross the British Columbia boundary in the region known as the Peace River country.

Skagit Contractors Confer With City Officials on Claims

Efforts to effect a compromise of claims in the dispute between the city of Seattle and the Winston Bros. Co., contractor on the city's Diablo Dam on the Skagit project, were started at a recent conference called by R. H. Thomson, city engineer. The contractors have filed demands for about $650,000 for extra compensation for work on the dam which was not included in the contract and for delays caused by the city and by weather conditions. A counterclaim of about $419,000 has been set against this by the city engineering department for failure to complete the contract within the specified time.

In the meantime 260 employees of the dam project have protested to city officials that the contractors have paid them less than the recognized city wage scale for the same type of work.

ONE OF A DISAPPEARING RACE



The wooden bridge depicted here spans the Juniata River in Pennsylvania, on the route of the Lincoln highway. The date of its erection is not definitely known, but it is supposed to have been built about 1818. The bridge has been in continuous use since and although made of wood, has withstood well the strain of present-day automobile traffic, without restriction as to loads that will clear 11 ft. 4 in. The trusses have a span of 181 ft. 6 in. Soon it will be only a monument to its builder, as a new concrete bridge is being built over the river in the immediate vicinity, for which Thomas Sheahan, of Hagerstown, Md., is the contractor.

Agree on Oakland Span of San Francisco Bridge

All differences between the State Toll Bridge Authority and the Oakland (Calif.) Port Commission on the length and height of span of the proposed San Francisco-Oakland bridge over the channel on the Oakland side have been ironed out, and an agreement has been reached whereby the span will be 1,400 ft. long with a vertical clearance of 185 ft. Recent additional borings indicate that a span of such length and height is economically feasible.

The Oakland Port Commission objected to the originally proposed span length of 700 ft and clearance of 161 ft., contending that a span of these dimensions would cripple the future development of port facilities. Because of this objection the State Toll Bridge Authority carried on further investigations and consulted Ralph Modjeski and Carlton S. Proctor, of Moran & Proctor, New York, regarding the feasibility of extending the span length. On Jan. 10 the consulting engineers recommended the revised length and height which have now been agreed upon. The increased span length, it is estimated, will add $4,000,000 to the cost of the bridge, which has been roughly placed at $78,000,000.

No hearing has yet been held by the war department.

District of Columbia to Build Two Incinerators

The District of Columbia has issued specifications for the construction of two incinerators, of 170 and 425 tons per day capacity, respectively. These incinerators will burn all household rubbish, business house rubbish, leaves and street sweepings and it is planned to operate them continuously 24 hours daily, using three shifts of operators. To this end large storage bins are provided and the furnaces are to be charged by means of traveling grab bucket cranes through pneumatic operated charging openings in the tops of the furnaces.

Smoke and dust from ash handling will be confined to the interior of the ash hoppers and furnaces and therefore will have no opportunity of entering working spaces. Provision is to be made for dumping ashes directly from the grates into individual ashpits or hoppers, provided with water quenchers and water seals. The quenched ashes are to be removed directly to electric motor-operated cars through pneumatically operated discharge gates at the bottom of each hopper. The drainage from the quenchers and water seals will be carried through pipes directly to the sewer.

At the smaller plant the quenched ashes can be dropped directly from the individual hoppers into motor trucks before transportation to dumps outside the city limits. At the larger plant the ashes are to be discharged from the electric car into a skip hoist and thence into a large storage bin, from which they will be removed by motor trucks.

Plans and specifications for the incinerators were prepared in the office of Metcalf & Eddy, consulting engineers, of Boston, as part of their contract with the District of Columbia.

Los Angeles Consolidates Its Water and Power Bureaus

Consolidation of the Los Angeles municipal water and power bureaus as one department of water and power was effected Jan. 13 by the board of water and power commissioners. H. A. Van Norman, formerly chief engineer and general manager of the bureau of waterworks and supply, was appointed chief engineer and general manager of the consolidated bureaus. E. F. Scattergood, formerly chief engineer and general manager of the separate bureau of power and light, was made chief electrical engineer of the new department.

The water and power commissioners also ordered the dismissal of four employees of the power and light bureau on charges that they were guilty of the removal and destruction of public records during the water bonds campaign in May, 1930.

The reorganization of the bureau was made to increase efficiency and economy, according to the resolution of the board.

Dead Center of Depression Is Past

The board of directors of the Chamber of Commerce of the United States issued the following statement at the conclusion of its meeting in Washington on Jan. 23:

"Upon the basis of reports from constituent member organizations in all parts of the country the board of directors of the Chamber of Commerce of the United States reaches the conclusion that the reinforcement of public confidence is at present the most essential factor in the resumption of normal business activity.

"These reports justify the hope that the dead center of the depression is past. A majority of them indicate a slight increase in business activity and an improvement in the employment situation.

"Whether or not there will be an upward trend in business in which all communities and business fields will share obviously depends upon the individual business man as well as the public agencies which have a relation to business.

"Confident planning on the part of business management, however, will depend in large measure upon the degree of certainty with which it will be able to forecast conditions which it must meet."

Plan Adopted for New Orleans Municipal Airport

The Orleans Levee Board has adopted the plan for the municipal airport which John Klorer, chief engineer of the board, presented. The estimated cost of the project is $1,500,000. The airport is to be located on the south shore of Lake Pontchartrain, just east of the Industrial Canal, which empties into the lake on the east boundary of the present lakefront park development. The field is to be a peninsula built on the lake with its southern boundary along the shore line, this boundary measuring 5,400 ft. Converging side boundaries into the lake terminate in a circular curve on the north end. The area of the field will be 287 acres and the projection into the lake will be 3,950 ft. Runways 3,500 ft. in length are possible in the direction of the prevailing wind. At present the field is to be used as an all-way field with planes landing and taking off from the turf.

In order to construct this field into the lake, 10,700 ft. of double bulkhead will be built along the converging sides. Hydraulic dredges will then be used to fill the space within the bulkhead with sand from the lake bottom. It will require approximately 5,000,000 cu.yd. of sand to complete the fill. Bids are now being asked for the bulkhead.

The field will be 7.9 miles from city hall by automobile. The shore end of the field will be near the Southern Railway lines, which will make it convenient for air and rail connections.

Officials Confer on Bridge Over the St. Lawrence

A basis of cooperation in building an international vehicular bridge over the St. Lawrence River was sought at a conference in Ottawa on Jan. 19 between United States and Canadian government officials, at which representatives from Canadian and United States river points were heard, but no decision as to site was made. It was announced that the following sites (with cost estimates) are under consideration: Collins Landing to Gananoque, $4,000,000; Morrisburg to Waddington, $3,800,000; Prescott to Ogdensburg, $3,200,000, and the Needle's Eye site, 3 miles west of Brockville, $3,000,000.

Concrete Pavement Yardage

Appended below is a tabulation of concrete pavement yardage awarded during the month of December, 1930, and also the total number of square yards awarded for roads, streets and alleys in the United States for the entire year 1930.

	Sq.Yd. Awarded During Dec., 1930	Sq.Yd. Awarded From Jan. 1, 1930 to Dec. 31, 1930
Roads	5,081,493	108,005,864
Streets	3,411,241	35,212,793
Alleys	314,835	2,600,800
Totals	8,807,569	145,819,457

Philadelphia Engineers Club to Discuss Concrete

"Concrete in Building Construction" will be the subject for discussion at the next meeting of the Engineers Club of Philadelphia, to be held in the auditorium of the club on the afternoon and evening of Feb. 17. The tentative program is as follows:

Afternoon session: "Concrete Masonry Back-Up," by W. E. Rosengarten, engineer, Lower Merion Township, Pa., and Horace T. Campion, consulting engineer, Philadelphia; "Influence of Concrete on Architectural Style," by F. S. Onderdonk, professor of architectural history, University of Michigan, and W. E. Hart, Portland Cement Association, Chicago; "Decorative Concrete," by John J. Early, sculptor and architect, Washington, D. C., and Walter H. Thomas, director of architecture, city of Philadelphia; "Inspection and Testing of Concrete Structures and Materials," by Miles N. Clair, Thompson & Lichtner Co., Inc., Boston, and Meyer Hirschthall, concrete engineer, D. L. & W. R.R.

Evening session: "Lightweight Aggregate," by F. E. Richart, research associate professor of theoretical and applied mechanics, University of Illinois, and A. W. Munsell, engineer of masonry inspection, Port of New York Authority; three papers on "Developments in Design": "Tall Buildings," by Frank Randall, consulting engineer, Chicago, and A. R. Lord, consulting engineer, Chicago; "Rigid Frames," by A. G. Hayden, design engineer, Westchester County (N. Y.) Parkway Commission, and George E. Beggs, professor of civil engineering, Princeton University; "Floor Finishes," by John G. Ahlers, secretary, Barney-Ahlers Construction Corp., New York, and Charles Schwertner, Sauter & Schwertner, general contractors, Philadelphia.

Engineering Institute of Canada Meets Feb. 4-6

Montreal, Que., will be the scene of the 45th annual general professional meeting of the Engineering Institute of Canada, which will be convened on Feb. 4 and will close on Feb. 6. Among the papers to be presented at the meeting are the following: "Train-Ferry Landings at Port Mulgrave and Point Tupper, N. S.," by D. B. Armstrong, Dominion Bridge Co.; "Construction of Steel Lock Gates of the Welland Ship Canal," by E. S. Mattice, National Bridge Company of Canada; "A Method of Laying Out Warped Surfaces of Hydraulic Structures," by C. P. Dunn, Alcoa Power Co.; "Breakwater Construction in Port Arthur Harbor," by F. Y. Harcourt, department of public works, Canada; "The Design of the Chute-à-Caron Diversion Canal," by G. O. Vogan, Alcoa Power Co.; "The Water Supply Problem in Southern Saskatchewan," by W. A. Johnson, Geological Survey, department of mines, Canada; "Automatic Block Signaling on the Canadian Pacific Railway," by A. J. Kidd, Canadian Pacific Railway Co.; and "Alexander Power Development on the Nipigon River," by T. H. Hogg, Hydro Electric Power Commission of Ontario. These will all be presented on Feb. 5.

During the morning of Feb. 6 a series of five papers will be given on various phases of the design and construction of the new office building of the Sun Life Assurance Company of Canada, Montreal. The afternoon of this day will be given over to a series of inspection trips.

A feature of the meeting will be the presentation of the Sir John Kennedy medal to George Herrick Duggan, president of the Dominion Bridge Co. and a member of the Engineering Institute of Canada, the Institution of Civil Engineers (England) and the American Society of Civil Engineers.

The Business Outlook

The ability of business to hold the line is becoming impressive, and is far more significant than its failure to make any spectacular gains. This resistance to further retreat has been evident in practically every indicator since the middle of December — in steel, coal, electric power production; in merchandise car loadings; and particularly in building contracts. Commodity prices and stocks have likewise shown a persistent narrow range of fluctuation, and on the positive side the bond market has made a fairly good recovery from its slump in the last quarter of 1930. All this is the more striking because it has come without any evidence of large-scale action by central banking authorities to check deflationary financial forces and hasten recovery, and in spite of a nasty political background.

—The Business Week, Jan. 28.

Colorado Engineers' Meeting

Engineering works involved in the establishment of Boulder City for the construction staff and forces of Hoover Dam were outlined by Sam Judd, U. S. Bureau of Reclamation, at the annual meeting of the Colorado Society of Engineers, held at Denver, Colo., on Jan. 17. Other papers included: "The Engineer's Part in Developing Colorado's Resources," by E. G. Plowman, University of Denver; "Modern Methods of Ore Finding," by Charles W. Henderson, U. S. Bureau of Mines, and "Precision in Engineering Instruments and Methods," by A. W. Ainsworth, Denver. The secretary is C. M. Lightburn, Denver, Colo.

G. S. Webster, Past-President, Am.Soc.C.E., Dies

George S. Webster, president of the American Society of Civil Engineers in 1921, died at his home in Philadelphia on Jan. 22. Mr. Webster, who was 76 years old, had served the city of Philadelphia and the State of Pennsylvania in various engineering capacities for 50 years.

Mr. Webster was best known for his work as chief of the Philadelphia bureau of surveys, in which capacity he was the directing head of many large municipal projects, including sewerage and sewage treatment, bridges, city planning, dock and harbor improvements.

Born in Philadelphia in 1855, Mr. Webster was graduated from the University of Pennsylvania in 1875 and immediately entered the city's engineering service. In 1892 he was appointed principal assistant engineer in the bureau of surveys and was quickly advanced to the post of acting chief engineer and in 1893 was made chief engineer. Design and construction of many large bridges were a feature of Mr. Webster's work. Among the most notable are the concrete arch bridge over Wissahickon Creek, the Grays Ferry and the Passyunk Ave. bridges over the Schuylkill River. He was a member of the Delaware River Bridge Joint Commission. As the city's representative Mr. Webster supervised the elimination of many grade crossings in Philadelphia.

Besides serving as president of the American Society of Civil Engineers, Mr. Webster had also been president of the American Society for Testing Materials and of the Engineers Club of Philadelphia.

Bids Called for Tunnel From Boston to East Boston

The transit department of the city of Boston will open bids on Feb. 25 for the construction of section A of the traffic tunnel between Boston proper and East Boston. The work consists of the construction of a steel and concrete tunnel, part of which is under Boston harbor, together with the construction of working shafts and ventilation shafts. This section of the tunnel will be about 4,800 ft. long and will be built by the shield method, using compressed air where necessary.

The tunnel will be of circular cross-section, about 31 ft. in diameter, being built of reinforced concrete inside of a welded steel lining. The tunnel is to be built on a straight line, the land portion being partly under buildings. The grade on the Boston side is 4.4 per cent and on the East Boston side 3½ per cent. The excavated material will be used for filling in the East Boston airport.

About two years is set for completion of the work, which will be under the charge of the transit commission, Ernest R. Springer, chief engineer.

Brief News

REGIONAL PLANNING AGENCIES in the United States have been swelled to the number of 50 by the appointment of county planning commissions in 22 California counties, comprising about one-half the state's area and more than half of its population.

THE CITY OF MONTREAL has been authorized by the Quebec government to borrow money to construct two tunnels under the Lachine Canal. The limit of cost is $5,500,000, of which the city, the Montreal Tramways Co. and the federal government will each pay a third.

A NEW HYDRAULIC LABORATORY to cost between $12,000 and $15,000 for use by students in the Tulane college of engineering, New Orleans, La., will be constructed and is expected to be in operation before the end of the school term in June. The laboratory will take up a floor space of 30x60 ft. in the main engineering building and an additional space of 15x40 ft. in an auxiliary department at the rear.

A CONSULTING ENGINEER will be engaged by the Geneva, N. Y., department of public works to prepare plans for the new sewerage system to be built in that city. The new plant will include a disposal plant, if the state insists that Seneca Lake be kept clear of Geneva sewage.

ENLISTMENT of private engineers and architects by the federal government has been urged upon President Hoover and Governor Roosevelt of New York by the architectural profession of the State of New York, it is announced by the American Institute of Architects. Such action, the architects assert, would speed the national program of employment.

A MARKED REDUCTION, compared with the preceding year, in the number of accidents at highway grade crossings is shown by reports for the first nine months of 1930 filed by the railroads with the Interstate Commerce Commission. Such accidents total 3,380 for the first nine-month period, a reduction of 709 compared with the same period in 1929. Fatalities totaled 1,448, a reduction of 263.

PLANS for a water tunnel 84 in. in diameter and nearly 3 miles long from Lake Montebello to Druid Lake have been approved by the Baltimore board of awards. A large part of the tunnel will be through solid rock. The estimated cost is about $1,000,000. Bids on the project will be called for in about three weeks.

A BILL introduced into the New York State Senate by Minority Leader Downing, of New York City, proposes to amend the public welfare law by providing that all wage earners above the age of 21 unemployed due to business depression shall be given two days work each week on public work at $5 per day from the date of the passage of the bill until May 15. It is estimated that it would cost $8,000,000 a week to give employment in this way to the estimated 800,000 out of work in New York State. The measure is sponsored by the State Federation of Labor.

COSTS AND CONTRACTS

E. N.-R. Index Numbers

Cost			Volume		
Jan. 1, 1931		**194.48**	**December, 1930**		**192**
Dec. 1, 1930		196.86	November, 1930		207
Jan. 1, 1930		208.96	December, 1929		166
Average, 1930		202.85	Average, 1930		260
Average, 1929		207.02	Average, 1929		317
1913		100.00	1913		100

This Week's Contracts

Heavy construction contracts, reported by *Engineering News-Record* in the week of Jan. 29, with some comparisons, total as follows:

(In Thousands of Dollars)

	Jan. 29, 1931	Average of Last Four Weeks 1931	1930
Buildings:			
Industrial	$1,488	$2,983	$8,929
Other	14,481	17,376	19,227
Streets and roads.	11,454	9,520	6,081
Other eng. constr..	9,612	22,428	15,492
Total	$37,035	$52,307	$49,729
Total, all classes Jan. 1 to 29:			
1931			$237,738
1930			238,936

SOCIETY CALENDAR

AMERICAN CONCRETE INSTITUTE, Detroit; annual convention, Milwaukee, Feb. 24-26.

AMERICAN SOCIETY FOR TESTING MATERIALS, Philadelphia; regional meeting, Pittsburgh, March 18.

ENGINEERING INSTITUTE OF CANADA; annual meeting, Montreal, Feb. 4-6.

NATIONAL PAVING BRICK ASSOCIATION, Washington; annual meeting, Pittsburgh, Pa., Feb. 4-6.

NATIONAL RAILWAY ENGINEERING ASSOCIATION, annual convention, Chicago, March 9-12.

ASSOCIATED ENGINEERS OF Spokane, Wash., elected the following officers at its annual meeting on Jan. 16: president, Robert T. Banks; vice-presidents, Richard McKay, Alex Lindsay, E. G. Taber and Henry C. Bertelsen; secretary-treasurer, Homer C. Bender.

MONROE CHAPTER, New York State Society of Professional Engineers, held its annual meeting on Jan. 19 and elected the following officers: president, Charles W. Marvin; vice-president, Arthur L. Shumway; secretary-treasurer, Roy H. Hendrickson. A code of ethics was adopted and recent revisions in the New York State educational law affecting engineers were approved.

OHIO ENGINEERING SOCIETY at its annual meeting in Columbus on Jan. 22 elected officers as follows: president, Ralph G. Taylor, Warren; vice-presidents, L. J. Fawcett, Youngstown, and J. R. Burkey, Columbus; secretary-treasurer, John Laylin, Columbus.

SAFETY CONFERENCE — The second annual Greater New York Safety Conference will be held in New York City on Feb. 25 under the auspices of the Metropolitan Chapter, American Society of Safety Engineers, Engineering Section, American Safety Council. A large number of associations, including industrial societies, boards of trade, chambers of commerce, and the American Society of Civil Engineers, are cooperating to make this meeting a success. Preliminary plans include an exhibition of safety devices.

Personal Notes

BREHON B. SOMERVELL, major, Corps of Engineers, has been relieved of duty at New Orleans, effective Jan. 31, and has been assigned to duty in the Memphis engineering district.

J. RUSSELL WAIT, formerly of the ports of Beaumont, Tex., and Charleston, S. C., has been appointed director of the port of Houston, Tex., succeeding B. C. Allin, who has resigned to accept a similar position at Stockton, Calif.

PAUL W. STEWART, who for the past seven years has been engaged in economic and market research in the department of commerce at Washington, has joined the staff of the A. O. Smith Corp., Milwaukee, Wis., where he will organize and direct a department of economic research.

SHERWIN F. KELLY, formerly assistant manager of Schlumberger Electrical Prospecting Methods, New York City, is no longer connected with that firm and will engage in consulting practice in geology and geophysics and in lecturing on geophysics at Northwestern University in March and at the Missouri School of Mines in April.

CARLOS P. HUNTINGTON, of Los Angeles, has been appointed director of the California professional and vocational standards department, succeeding James F. Collins, who resigned, effective Jan. 5. Mr. Huntington is a lawyer, but recently has been in the paving business. The department of which he has been appointed director is in charge of administration of the state licensing law for contractors.

Obituary

WALTER S. DICKEY, of Kansas City, Mo., head of the W. S. Dickey Clay Mfg. Co., died of heart disease on Jan. 22. Mr. Dickey was 68 years old. He was active in politics and at one time was a member of the Missouri Waterways Commission and in 1917 was appointed vice-chairman of the Inland Waterways Commission of the United States Railway Administration.

LOUIS GUSTAVE PAPINEAU, of Montreal, died on Jan. 19, aged 75 years. Mr. Papineau had been attached to the federal department of public works, having charge of the shipyards at Sorrel from 1908 to 1912. He was a member of the Engineering Institute of Canada.

HENRY MAY GITTINGS, who until he retired about five years ago was engaged in civil engineering in Baltimore, died at his home in that city on Jan. 22. Mr. Gittings was 52 years old.

THOMAS J. O'NEILL, secretary of the O'Neill-Orr Construction Co., of Miami, Fla., died on Jan. 14. Mr. O'Neill, who was born in Boston 67 years ago, went to Florida 45 years ago and located in Miami in 1920.

Equipment and Materials at the 1931 Road Show—II

Wide range of accessories for road-construction equipment on display—Influence of central-mixing development shown in number of special truck bodies exhibited

Engineering News-Record Staff Report

IN LAST WEEK'S issue was the first part of this description of all the exhibits shown at the 1931 Road Show, held at St. Louis, Jan. 12-16. The description of the show is concluded in the following:

Accessory Equipment—Many special wheels and tracks for tractors and trucks were shown by several manufacturers. Wehr Co. displayed its all-purpose cleated wheel, a dual solid-rubber-tired wheel with special spring-controlled lugs that fit between the dual wheels when not being used. Euclid Crane & Hoist Co. showed an improved track wheel for wagons and an assembly board showing the details of construction. Steel wheels for trucks and tractors were shown by the Electric Wheel Co. Trackson Co. displayed a new model GH crawler for tractors with a variable-height front-axle sprocket for various working conditions, mounted on a Trackson high shovel. Trackson also showed crawler units in 6-ton, 10-ton and 15-ton sizes, and a Trackson crawler mounted on a McCormick-Deering 20 tractor. Crawlers for replacing rear tractor wheels were shown by Moon Track Co., displaying the units on a McCormick-Deering and a Case tractor. Athey Truss Wheel Co. showed a truss-wheel crawler unit, 10-ton size, and a 15-ton size cut away for demonstration purposes. The Rightway Corp. exhibited a Rightway multi-wheel traction unit, consisting of four wheels, the rear two being narrow-gage in respect to the front two. The rear wheels are chain-driven from the front axle. The wheels are solid-rubber-tired, but are equipped with steel lugs that can be quickly placed over the tires, the lugs nesting into the rims when not in use. Tructor Corp. showed steel crawler-tread Tructor attachments on Ford and Mack trucks with tandem dual rear wheels.

Special Gearing and Drives

Westinghouse-Nuttall gearing apparatus for all industrial equipment was shown by Westinghouse Electric & Mfg. Co. Westinghouse also exhibited a new Wise multiple-speed drive, hooked up in connection with an electric motor, that permits four instantaneous changes in speeds, the four speed changes being available in 300 combinations. A reduction-gearing unit for industrial use was shown. Morse Chain Co. showed a line of silent chain drives, speed reducers and flexible couplings.

Magnetos were on display by United American Bosch Corp., Eisemann Magneto Corp., Wico Electric Co., Appollo Magneto Corp (which also showed steering stabilizers) and the Splitdorf Electrical Co., which included a line of spark plugs. Bendix-Westinghouse Automotive Air Brake Co. exhibited an air-brake system for automotive equipment with small compressors. Vacuum brakes for trucks, buses and trailers were shown by Bragg-Kliesrath Corp.

Axles and Wheels

Axles for trucks were shown by Wisconsin Axle Co., Timken-Detroit Axle Co., and Eaton Axle & Spring Co. The St. Paul Hydraulic Hoist Co., makers of hydraulic hoists for truck bodies, had no separate display of equipment, but many of the company's hoists were shown on trucks on the floor. Geneva Metal Wheel Co. showed steel wheels, roller bearings and axles. Single and dual pneumatic steel wheels and electric steel brake drums were shown by Dayton Steel Foundry Co.

Wehr Steel Co. displayed heat-treated alloy castings, gears, sprockets and sheaves. Gears and Forgings, Inc., exhibited a line of gears, reduction units, power-transmission equipment and drop forgings. Commercial forgings and castings were shown by the Davenport Locomotive & Mfg. Co. and by Geo. E. Smith Steel Casting Co. Sivyer Steel Casting Co. showed new design bucket and dipper teeth made of Nukeel and a line of Miraculoy pulleys, hooks and sprockets. Brass and bronze bushings and bearings were shown by the Bunting Brass & Bronze Co. The Universal Bearing Metals Corp. featured its Bearium metal.

Bearings

Roller and ball bearings were on exhibition by the following firms: Roller Bearing Co. of America, Heliflex roller bearings; New Departure Mfg. Co., ball bearings and a new angular contact double-row pre-loaded ball bearing for construction equipment; Hyatt Roller Bearing Co., roller bearings; Timken Roller Bearing Co., roller bearings of all types; Norma-Hoffman Bearings Corp., ball, roller and thrust bearings and the new Greaseal bearing; Fafnir Bearing Co., ball bearings; and the SKF Industries, Inc., ball and roller bearings.

Western Metal Specialty Co. showed sheet metal engine housings, truck hoods, fenders and gas tanks. Purolator oil filters, a vacuum tank filter and a new gasoline hose filter were shown by Motor Improvements, Inc. Zenith-Detroit Corp. had a line of carburetors, and the K-P Seat Co. showed several cushion truck seats. The Brown-Lipe Gear Division of Spicer Associated Companies had a line of automotive equipment. Clutches of various sizes and types, gear-reduction units and power takeoff units were displayed by Twin-Disc Clutch Co. Radiators, unit heaters, blast cores and oil coolers were shown by Perfex Corp. and by Young Radiator Co. Grader blades were exhibited by General Wheelbarrow Co. and by Shunk Mfg. Co.

General and Miscellaneous Equipment—Westinghouse Electric & Mfg. Co. showed a portable 1-KW electric-power unit driven by a Briggs & Stratton gas engine, and a Westinghouse 200-amp. portable welder. A 300-amp. portable welder driven by a Buda engine was exhibited by Schramm, Inc. Kohler Co. had on hand a model EH 1½-KW 110-volt d.c. generator unit driven by a gas engine, and a cutaway model of its type D machine of the same size.

Burch Corp. exhibited a machine for filling cracks with mastic. The machine is hand-operated and is heated by an oil burner. Burch also showed a model of a four-wheel transport belt car unloader. Humboldt Mfg. Co. displayed a full line of testing equipment for road materials such as asphalts, oils, gravel, sand and cement.

Black & Decker had on hand three models of truck wheel Loadometers for roadside load testing. The design of these scales had been incorporated into a new 50,000-lb. test Loadometer for testing culvert pipe, terra cotta and concrete products and manhole covers. A combination punching and shearing machine was shown by Henry Pels & Co., Inc. It is of steel-plate construction and will shear, punch, notch and split all structural shapes. The Aluminum Co. of America showed sections of aluminum alloy shapes and castings and aluminum furniture. The Equipment Corporation of America had on hand literature describing its service in handling rebuilt equipment of all kinds.

Road-Marking Equipment

A new idea in road-marking machines was introduced by Harley-Davidson Motor Co. A marking attachment was mounted on a standard H-D two-cylinder motorcycle, the marker being fed by a De Vilbiss paint sprayer carried on a sidecar along with paint supply tanks. The sprayer was powered by an H-D power unit. Harley-Davidson is showing its air-cooled 2¾-hp. engines as separate power units available for general use for the first time. A special all-aluminum 2¾-hp. engine was also shown. The exhibit included a standard H-D motorcycle equipped with an ambulance first-aid kit and fire extinguishers for patrol duty.

Russell Mfg. Co. showed a line of canvas, woven and rubber conveying and power-transmission belting, also flat, round and V fan belts. Molded brake-band lining and Rusco and Rusco

Ace brake linings and clutch facings were included in the exhibit. Titeflex Metal Hose Co. showed a line of all metal flexible fuel lines and a new flexible exhaust tubing, pressure type, in sizes varying by ¼ in. from 1½ to 4 in. Hamilton Mfg. Co., makers of drafting furniture, showed a new all-steel autoshift drawing and reference table and a new Junior tracing table with a lighted glass surface, in addition to a new Calumet wood drawing table, filing cabinets and stools.

Highway Trailer Co. exhibited its model D earth-boring machine mounted on a Ford truck, for boring holes for power line and telephone poles. The rig has a capacity of 50 to 60 holes per day and will bore through shale, limestone and hardpan. It is fitted with augers from 6 to 24 in. Macleod Co. showed a sandblast machine on wheels, rated at 600 lb. capacity, a 5-gal. paint sprayer, kerosene-burning concrete-mixer heaters in blower and coil types and a new 1-cu.ft. cement and sand sprayer. Lakewood Engineering Co. exhibited hand finishing belts and a model of its concrete hoist tower.

A new Olsen portable concrete beam tester was shown by Tinius Olsen Testing Machine Co.; a road rater, a device that checks the smoothness and regularity of concrete road surfaces, marking high and low spots, was another new offering by Olsen. Other exhibits by this company included the Olsen-Boyd cement tester for briquettes, an automatic shot cement tester, and the Olsen-Lundgren semi-automatic balancing machine for balancing crankshafts, a new development. South Bend Lathe Works showed a new model 36 in x 6 ft. motor-driven brake drum lathe, an 18 in. x 8 ft. motor-driven lathe especially for highway department repair shops, and a Junior 9 in. x 3 ft. motor-driven lathe.

Jos. Greenspon's Sons showed a line of water and oil pipe. Linde Air Products exhibited numerous lighting and welding units. The display included: Prest-o-Lite floodlight attachment, Oxweld W-17 blowpipe and cutting attachment, Oxweld R-43 oxy-welding regulator, portable oxy-acetylene welding and cutting outfits, Prest-o-Lite headlights, Carbic floodlights, Prest-o-Lite primer for gasoline engines, and the Oxweld portable tensile testing machine. Haynes Stellite hardening applications to scrapers, dipper teeth and other machinery parts exposed to abrasive wear were included in the Linde exhibit.

Bulk-Cement Pumps

Fuller Co. showed two new Fuller-Kinyon portable bulk-cement and asphalt-filler pumps and car unloaders. The larger one is self-propelled, is powered by a 20-hp. Westinghouse motor and is rated at a capacity of 175 bbl. per hour. The smaller pump, rated at 80-90 bbl. per hour, is driven by a 10-hp. Westinghouse motor.

A new line of all-steel scale equipment was shown by Winslow Government Scale Works, assembled of structural-steel shapes.

Barber-Greene Co. showed a new bulk-cement unloader. This machine is a portable electric-drive unit with a large screw gathering device and a chain-bucket elevator.

Rock-Crushing Machinery

Aggregate Handling Equipment—The show included an extensive display of crushing machinery, many models of which are new or improved. Universal Crusher Co. showed a line of jaw crushers including 8x36-in., 9x16-in., 8x12-in. and 8x10-in. sizes, all without power. A 15x36-in. portable mounted crusher with a chain-bucket loader was also shown. Diamond Iron Works, Inc., displayed a Diamond roller-bearing 8x36-in. jaw crusher and a new Diamond portable rock-crushing plant, containing a 15x36-in. primary jaw crusher and a roller secondary crusher unit. A model rock-crushing plant in operation and a model vibrating screen were shown by Good Roads Machinery Co.

Williams Patent Crusher and Pulverizer Co. showed its model H5 Super-Jumbo hammer crusher, capable of reducing steam-shovel rock to 1¼-in. size in one reduction at the rate of 150 tons per hour. The model H2 Jumbo Junior hammer crusher was on display. This machine reduces "one-man" rock to 1¼-in., ¾-in. size or to dust in one reduction. Models were shown of the Williams non-clog crusher for handling wet and muddy rock and of the new Kam-Tap vibrating screen. Jeffrey Mfg. Co. exhibited a portable rock-crusher unit, separate power drive, which has a capacity from 5 to 25 tons per hour in crushing to ½- to 2-in. size, respectively.

A new 10x20-in. jaw crusher of armor plate and ball-bearing construction and with an extra long die plate was shown by Gruendler Crusher and Pulverizer Co. This firm also had on hand a 30-in. diameter hammer-type crusher direct-connected to an LA 25-hp. electric motor. Jas. H. Beans Foundry Co. showed a new Ohio 4½x24-in. crusher with but one moving part. A new spring steel used in sand and gravel screens was on display by the Ludlow-Saylor Wire Co.

Iowa Mfg. Co. showed its model 916 roadside portable crusher, mounted on four rubber-tired wheels and powered by an Allis-Chalmers engine. This rig is primarily for reducing oversize highway material. Besides the new model 336 and model 936 crushers, the Iowa Co. displayed a one-piece road-crushing, screening and loading plant.

Pioneer Gravel Equipment and Mfg. Co. exhibited a portable gravel-washing, screening, crushing and loading plant, model 300W, mounted on six steel wheels and fitted with both shaker and revolving screens. Pioneer also showed a model of its contractors' size 12 screening, crushing and loading plant, fitted with a patented inclosed shaker screen.

Weighing batcher aggregate bins were exhibited by three manufacturers. Heltzel Steel Form and Iron Co. showed a three-compartment portable Agrabatcher weighing bin with three separate weighing hoppers, the hoppers connected with an automatic springless scale with an extra large dial. The three hoppers can be loaded and discharged separately or discharged in unison. When being moved the bin is tipped over on one side and rides on two steel trailer wheels. Heltzel also showed a portable bulk-cement plant with a weighing batcher.

Butler Bin Co. showed a portable bulk-cement plant with a weighing batcher and a two-compartment aggregate batcher bin with separate weighing hoppers. The bin is equipped with a new beam scale with a springless telltale dial. The plant is erected on collapsible legs, which permit the whole to be lowered onto a four-wheel rubber-tired carriage for moving. The carriage is carried within the frame of the plant when not in use.

Blaw-Knox displayed a 110-bbl. portable bulk-cement plant with a 1,000-lb. weighing hopper. The plant is charged by a Link-Belt elevator. The aggregate batcher shown by Blaw-Knox was a 51-ton plant with double weighing hoppers. A triple weighing batcher was shown separately, which can be incorporated into the aggregate plant if desired. A Cementank bulk-cement container, a new device for batch trucks, was also shown. One of these tanks is used for each compartment in the truck body.

Barber-Greene Co. introduced a new model 62 crawler, mounted, disk-feed, bucket loader, fitted with a weighing hopper equipped with an American Kron scale, 3,600-lb. capacity.

N. P. Nelson Iron Works showed a Q-7 heavy-duty crawler bucket loader mounted on a McCormick-Deering 20 industrial tractor. A new multiple-material weigh batcher to handle three materials was shown by C. S. Johnson Co. The scales on this batcher have three separate beams, which can be used separately or in unison. Separate hopper gates feed each hopper. Johnson also exhibited a Bantam weigh batcher, a bulk-cement cart to which a scale can be attached, and a line of standard single-material weigh batchers.

Reinforcing Material and Fencing

Materials and Supplies—A full line of bridge and road accessories displayed by Union Steel Products Co. included reinforcing bar hangers and chairs, furring hangers, dowel sleeves and beam spacers. American Steel & Wire Co. exhibited wire highway guard rope, fence fabric and electric-welded wire reinforcing fabric. Truscon Steel Co. showed metal products consisting of pavement center strips, welded steel reinforcing fabric, steel pavement expansion joints, curb bars and reinforcing bars. Electric-welded reinforcing fabric and models of equipment for placing it in the slab were shown by National Steel Fabric Co. Both overhead and slide type of fabric installers were shown, along with a model of National's cleft joint machine.

Wire ropes and cables were on display by Hazard Wire Rope Co.; Wickwire Spencer Steel Co., which also included its Clinton electric-welded fabric; A. Leschen & Sons Rope Co.;

Broderick & Bascom Rope Co.; and American Cable Co., Inc., which also included a line of fittings. Property fences were shown by the Cyclone Fence Co. and by American Wire Fence Co.

A new idea in steel floor plates was shown by Central Iron and Steel Co. This company has slotted its Knobby floor-plate units to provide light and ventilation, when used in structural-steel framing. A full line of standard Knobby non-skid floor plates and traffic treads was displayed. Alan Wood Steel Co. showed steel traffic-tread plates for bridges and also steel running boards for trucks and other equipment. Reinforcement and armoring for bridge floors and highways in both unified and continuous types were shown by Irving Iron Works Co.

Paving and Accessories

National Paving Brick Manufacturers' Association was on hand with literature, moving pictures, photographs and models of a brick-paved intersections, rural highways and the recently laid experimental metal-base brick pavement. Literature, pavement samples and photographs of the Vibrolithic process of laying concrete pavement were shown by the American Vibrolithic Corp., along with a vibrating-compacting machine.

Calcium chloride for curing concrete, accelerating set, removing ice and snow, laying dust and material for road binder was shown by Solvay Sales Corp., Columbia Products Co. and the Dow Chemical Co. Colloy Products Co. showed its colloidal-clay admixture for concrete.

Lubricating oils and greases were displayed by Columbia Oil Co., Sinclair Refining Co. and D-A Lubricant Co., Inc.

Asphalt Plank, Elastite expansion joint and molded asphalt rail fillers were shown by Philip Carey Co. Johns-Manville Corp exhibited asphalt bridge plank, expansion joints, roofings, friction materials, and Celite concrete admixture. Servicised Premoulded Products Co. showed a line of asphalt industrial flooring, rail filler, expansion joint, center contraction joint, and Duo-type rubber-fibrated asphalt paving flooring. W. R. Meadows, Inc., showed asphalt premolded expansion joint, bridge flooring, planking, and rail fillers.

Three wood-preserving exhibits were on the floor. Wood Preserving Corp. and American Wood Preservers' Association both showed models and samples of creosoted timber and structures. American Lumber & Treating Corp. showed samples of the Wolman Salts treatment of wood, which leaves the product in shape for painting if desired.

The Portland Cement Association displayed photographs, maps and literature. Lone Star Cement Co., subsidiary of International Cement Co., was on hand with literature featuring its Incor high-early-strength cement. Missouri Portland Cement Co. had an extensive display of charts and literature to feature its Prestolith high-early-strength cement.

United Paper Co. displayed its Tufcote, a heavy paper reinforced with jute fiber and impregnated with asphalt. It can be used for curing concrete pavement, usable several times over; as a waterproofing fabric and as a building paper. Vellumoid Co. showed an extensive line of fiber gasket material and sheet packing.

Concrete Machinery

Concrete Mixers and Trucks — A 3½-ft. barrel mixer on two wheels and fitted with a Stover engine, shown by Gilson Bros. Co., was the only mixer on the floor other than the transportation type. An aluminized welded concrete agitator body mounted on a Ford truck chassis was shown by Concrete Transport Mixer Co. in connection with the Aluminum Co. of America.

Lee Transit Mixer Co. showed a 1-yd. transit mixer on a Ford truck chassis. This mixer is charged at a central plant, water included, and the concrete is mixed on the way to the job. The loaded drum can be lifted off the chassis by a crane, so the concrete may be dumped directly into the forms from the mixer. Power for rotation of the drum is taken from the truck engine. Transit Mixer, Inc., showed two Paris transit mixers, one unmounted, and the other mounted on a Hug Roadbuilder truck.

Clinton Motors Corp. showed a Clinton ready-mixed concrete conveyor mounted on a Clinton heavy-duty truck. The concrete drum is of larger diameter than former models and has a large door in the rear of the drum permitting handling concrete of any slump. It is handled by a Wood Hi-Lift hydraulic hoist. The truck is built specially for concrete carrying. A separate motor operates the mixer drum.

A new line of concrete machinery was displayed by the Portland Concrete Machines Co. A Portland Truck Mixer was mounted on a model 55 White truck chassis. The mixer drum is prismatic in shape and holds 3 cu.yd. It is dumped by a St. Paul truck hoist, and a separate 12-hp. Le Roi engine drives the drum. Portland also showed and operated a concrete-block-making unit. A skip hoist charges a 24-c.f. Portland open-drum batch mixer, the mixer driven by an Allis-Chalmers unit. From the mixer the concrete goes into a Portland model K face-down block machine. This machine has a capacity of 4½ blocks per minute.

Blaw-Knox showed a 3-yd. concrete agitator truck body on an International truck. The agitator mechanism is geared to the truck transmission.

Forms and Finishing Machines—In response to the demand for a heavier road form with a wide base, five manufacturers introduced steel forms with an 8-in. base. Lakewood Engineering Co. showed its Duo-rail form with the new width base. Metal Forms Corp. showed a new 8-in. line of Metaforms, along with a display of curb and gutter and sidewalk forms. Blaw-Knox showed a new 8-in. base road form and the old 6-in. road form, sidewalk and curb forms. A new design of road forms shown by Hotchkiss Steel Products Co. included one of 8-in. base. These forms have a special positive lock at the joint and are reinforced at the ends. New 1-in. or old ⅞-in. stakes can be used interchangeably. Hotchkiss also showed a line of sidewalk, curb, and gutter forms.

The new 8-in. base form brought out by Heltzel Steel Form and Iron Co. has hot pressed-steel stake pockets, a new superior lock-type joint. Another type of 8-in. form is equipped with an adjustable lip. Heltzel introduced a new macadam form of tubular steel with a dowel and tongue joint. No stakes are required for this form. Other forms shown by Heltzel include a new Pennsylvania type that is raised vertically when being stripped, a new adjustable height form for widening and resurfacing old roads, integral curb forms for city streets and a line of steel forms for sidewalks, curbs and gutters.

American Rolling Mill Co. announced at the show a new development, Metalcurb, for use in resurfacing old roads. The curb consists of Armco iron plates held in place by stakes and flat crosstie rods which lie close to the old road surface. The curb is designed for use in resurfacing with almost any type of wearing surface, such as brick and asphalt or bituminous materials.

Aluminized road forms were shown by the Aluminum Co. of America. W. S. Godwin Co. exhibited a line of steel paving guards, curb edgings and rustless steel facing for curbs.

There were three concrete-slab finishing machines on display. Lakewood Engineering Co. showed a new combination tandem screed finisher with a tamper. Blaw-Knox exhibited its Ord double-screed finishing machine. Heltzel Steel Form and Iron Co. introduced a finishing machine that will place nearly all classes of joint materials mechanically. The machine screeds and finishes the slab with a steel or wood float. It will cut transverse contraction joints and place the joint material. Heltzel also showed a new removable steel expansion joint plate, for use with poured joints, with a provision for installing dowel bars.

Bituminous Paving

Bituminous Pavements and Surfaces —The Asphalt Institute had an extensive exhibit of bituminous road materials. Members showing with the Institute included Standard Oil Co. of Louisiana, Standard Oil Co. of New Jersey, Standard Oil Co. of Indiana, Standard Oil Co. of New York, The Texas Co., James B. Berry's Sons Co., Barber Asphalt Co., showing Trinidad and Bermuda Lake asphalts, Genasco crack filler for concrete, and Curcrete asphalt emulsion for concrete curing; and the Hastings Pavement Co., showing asphalt paving and flooring blocks. W. R. Meadows, Inc., displayed soap-type emulsified asphalts. Shell Petroleum Corp. was represented. American Bitumuls Co. displayed Bitumuls products for penetration pavement construction and repair, for retread and road-mix and for premixed materials.

The exhibit of Flintkote Roads, Inc., included literature and samples of Colas pavement material and a selection of drums, pouring pots and a hand-spraying outfit for the application of Colas. Thos. E. Collins & Co. displayed its Teco cloth fabric, used in the construction of bituminous macadam roads.

Bituminous road materials were displayed by the following: Barrett Co., Tarvia-Lithic, ready-to-lay road material; Headley Emulsified Products Co.; American Tar Products Co., Tarmac material; Macasphalt Corp. of America, cold-laid asphaltic paving mixtures; Colprovia Roads, Inc., all types of asphaltic pavements produced cold; West Process Pavement Co., Westphalt hot-lay pavement, Westphalt new cold-lay pavement and Westphalt new retread; Amiesite Asphalt Co. of America, Amiesite road material.

Bituminous Material Distributors

Bituminous Material-Handling Equipment—Several bituminous material distributors mounted on trucks were displayed. Kinney Mfg. Co. showed the Kinney Junior truck asphalt and tar distributor on a Ford truck chassis, with the distributor independently powered by a New Way engine. A Brockway-Indiana 3-ton truck chassis carrying an 800-gal. distributor was shown by Brockway Motor Truck Corp. The distributor is powered by a separate Continental engine. E. D. Etnyre & Co., Inc., showed its model F tar and asphalt distributor, 850-gal. capacity, mounted on a Hug 5-ton chassis. Barrett Co. showed a 750-gal. standard distributor on a General Motors truck.

Sam Finley, Inc., displayed models of the Finley truck bituminous distributor and of the Fin-Roc surface mixer. This last is a pulled machine equipped with four distributors and mixing blades. The rig carries two asphalt- or oil-heating tanks. A bituminous distributor on a Mack truck was shown by Chas. Hvass & Co., Inc., Hvass also displayed a bituminous auxiliary tank trailer distributor, fitted with a Continental engine. A tank-car heater with an oil-burning 30-hp. boiler was shown by J. C. Cleaver Co., Inc. Macleod Co. displayed a 110-gal. tar kettle with a coil burner.

A new weighing batcher for liquid asphalt, accurate to within 6 oz., was shown by Exact Weight Scales Co. This scale is designed to eliminate poor proportioning in asphalt mixes. Mohawk Asphalt Heater Co. showed a new Hotstuf three-in-one combination tool, asphalt and surface heater, mounted on two wheels. A line of asphalt heaters was also shown by Mohawk. F. D. Cummer & Son Co. showed literature on asphalt plants, as did also J. D. Farasey Mfg. Co.

Hetherington & Berner, Inc., exhibited a model of a complete railway asphalt plant. The full-size plant is mounted on a special railroad car 65 ft. long. This firm announced a new asphalt patch plant. Littleford Bros. showed a maintenance kettle, model 84-D, mounted on pneumatic tires. This asphalt kettle has a hand-spray attachment and can be towed at a speed of 35 miles per hour with the burner in operation. Littleford also exhibited its Trail-O-Heater, a 300-gal. asphalt kettle with a motor-driven spray attachment; and a motor-driven emulsion sprayer, with a Briggs & Stratton engine.

Iowa Mfg. Co. showed a new bituminous road mixer. This machine is self-propelling, picks up the road metal from a windrow by means of a bucket elevator, mixes the metal with asphalt, tar or oil in a long trough and drops the mixed material on the road in another windrow. Two heated tanks supply the bituminous material. The machine, powered by a Hercules unit, can travel 8 miles per hour when working.

Barber-Greene Co. has adopted its new model 62 crawler bucket loader as a new bituminous road mixer. The rig is equipped with an auxiliary storage bin and bituminous mixer attachment. Road metal is picked up by the loader, put through the mixer, where the bituminous material is added from a tank wagon, and after being mixed the material is dumped onto the road. Immediately behind the first machine follows another rig consisting of a screw spreader, which spreads the mixed material the full width of the road, and a mechanical tamper that compacts the material in place. The spreader and tamper is a self-propelled unit, fitted with a Buda engine. It rides on side forms and has telescoping axles that are adaptable to any width road between 16 and 20 ft.

Trucks for Highway Service

Trucks—Nearly a score of manufacturers exhibited 50 different models and sizes. Lack of space does not permit a detailed description of each of these models. Many were equipped with dump bodies, Heil and Wood bodies predominating. A glimpse of what is coming on our highways in the near future was shown by Relay Motors Corp. in its mammoth Relay Duo-drive twin-engine truck.

Autocar Co. showed one truck with a Paris concrete transit body and one with a batch dump body. Four Wheel Drive Auto Co. showed two models, one equipped with air brakes. Eight trucks were shown by Dodge Bros. These included all types bodies and some were equipped with snow plows and grader blades. Chevrolet had six trucks on the floor. Reo Motor Car Co. displayed two models, both with dump bodies. Three trucks were included in the Brockway-Indiana display of the Brockway Motor Truck Corp., one a 7½-ton chassis. Hug Co. showed a special Tructor unit on one of its trucks.

Three new models were shown by White Co., including a heavy-duty 100-hp. truck with auxiliary power for hoists, a three-compartment dry-batch dump truck and a light fast model for highway maintenance. The first two are 6-cylinder models, and the last is a 4-cylinder engine. Ford Motor Co. exhibited three 1½-ton trucks and one ¾-ton pickup model. A new contractors' body was mounted on one of the heavy chassis. This consists of a stake body with a general utility inner bin and provisions for hauling pipe and other long material. S. P. A. Truck Corp. showed three Pierce-Arrow and one Studebaker truck from 2- to 5-ton capacities. One 5-ton model carried a Blaw-Knox agitator-concrete body.

Clinton Motors Corp. showed one truck, a heavy-duty model carrying a Clinton concrete-conveyor body. General Motors Truck Co. exhibited four models, all with dump bodies. One 2-ton model was equipped with a separate Quincy air compressor powered by a separate unit. All G-M trucks shown were 6-cylinder models. Four models ranging from 1½ to 5 tons in capacity were shown by Federal Motor Truck Co.

Linn Mfg. Co. showed a Linn Tractor Truck with a 7-yd. three-way dump body operated by a hydraulic hoist.

Bodies and Hoists—Galion Allsteel Body Co. showed three all-steel truck bodies fitted with Galion hoists. A 1½-yd. aluminum body on an Indiana truck was shown by Superior Body Corp., along with a 1½-yd. self-dumping steel body on an International truck. Perfection Steel Body Co. exhibited three dump bodies: a 1½-yd. mechanical dump, power takeoff; a 1½-yd. combination hand and gravity dump; and a 1-yd. gravity dump with removable sides. Hercules Products, Inc., showed four new bodies, with mechanical, hydraulic, gravity automatic and power rotary dumping mechanisms.

Twin-cylinder hydraulic hoists were featured by Heil Co. in its hoist and body exhibit. Four bodies shown included a 4-yd. two-compartment model with separate bulk-cement containers, a 5-yd. high-lift, 1½-yd. and 2½-yd. with removable sides. Heil also showed a new combustion oil burner for furnaces. Wood Hydraulic Hoist and Body Co. had literature only at its booth, but had many exhibits of bodies and hoists on trucks and other equipment displayed on the floor.

An aluminum dump body was shown by the Aluminum Co. of America. Highland Body Mfg. Co. showed two steel truck cabs, one a new sleeper model for long-distance work. A 6-ft. bunk is placed just behind the driver's seat. A new heavy-duty pipeless hydraulic hoist with a 6-in. cylinder was shown by Anthony Co., Inc.

Refuse Collectors

Something entirely new in covered refuse collectors was shown by Cities Equipment Corp. in the Von Keller refuse collector, a rotating drum body that tilts downward at the front when loading. Refuse is put in at the rear, and the rotary motion of the drum carries it to the front and low end of the container. Baffle plates inside the drum assist in pushing the refuse forward and filling the container. The drum is 14-yd. capacity and is dumped by a Wood hydraulic hoist. A smaller model Von Keller refuse collector, 4½-yd. trailer model for alley col-

lections was shown mounted on four wheels.

Tractors—While there was an extensive display of tractors on the floor, there were no unusual new developments noted. Minneapolis-Moline Power Implement Co. showed a new Twin-City industrial tractor with Zero-Pressure Goodrich pneumatic tires in the rear. The tractor is powered by an M-M 25-hp. valve-in-head unit. J. I. Case Co. showed four Case tractors, two with solid-tired dual traction wheels, one with pneumatic dual-traction wheels and one mounted on a Trackson crawler. Ford Motor Co. showed a Fordson Tractor on four steel wheels.

Cleveland Tractor Co. exhibited two new Cletrac models, 15 and 40-30, powered by Hercules. Other models shown were 20 with Cletrac engine, and 40 and 80-60 with Wisconsin engines. New model 80 and a new model 45 Bates tractor, the first especially for snow-removal work, were displayed by Foote Bros. Gear and Machine Co. A Bates 35 with the new Bates bulldozer was also shown. All Bates tractors are Waukesha powered.

Caterpillar Tractor Co. showed a model 30 fitted with special snow tracks, snow sprockets, cab and lights for snow-removal work. Other tractors displayed by Caterpillar included models 10, 10 high clearance, 20, 15, 60, and 15 and 20 with side-seat arrangement to permit easy handling of trailer equipment. International Harvester Co. showed four McCormick-Deering Industrial tractors, two model 30 and two model 20, fitted with various rear-traction units of solid-rubber tires, pneumatic tires and tracks. Model 200 and model 300 McCormick-Deering power units were also displayed.

Michigan Power Shovel Co. showed an Allis-Chalmers tractor fitted with Sur-Trac crawlers with rubber track. Allis-Chalmers Mfg. Co. showed three model U industrial tractors fitted with solid-rubber tires, pneumatic tires and one with narrow-tread wheels. Two 35 tractors, a 50 and a 75, all on crawler tracks, were included in the Allis-Chalmers display.

Dump Wagons

Wagons and Trailers—Western Wheeled Scraper Co. showed a new 5-yd. dump wagon with an automatic spring windup. The energy of a dumping load winds up a heavy coil spring, which, in turn, winds up the bottom-dump doors at the will of the operator. Stroud Road Machinery Co. exhibited a model of its Little Red dump wagon. The largest dump wagon on the floor was a 16-yd. trailer shown by A. Streich & Bro. Co. This rig is equipped with Push Track wheels front and rear. Other Streich exhibits included two 7-yd. dump trailers on four steel disk wheels, and a cart type trailer, 7-yd. capacity and all-steel construction on Track wheels. All Streich trailers are closed by power takeoff from the tractor or by hand windup.

Ohio Locomotive Crane Co. showed a 4-yd. gravity-dump tractor dump wagon equipped with a McCormick-Deering power unit. There are five twin heat-treated rollers in the gear-driven track of this wagon. The front wheels are steel. Hughes-Keenan Co. exhibited its Iron Mule on a McCormick-Deering tractor and carrying a 4-yd. rear-dump body. The Iron Mule has crawler tracks in the rear and steel wheels in front.

Euclid Crane & Hoist Co. introduced an improved track-wheel dump wagon equipped with a new hydraulic control that permits the bottom-dump doors to be opened to any position, allowing the material to be spread if desired. Euclid also showed a gravity dump wagon on track wheels. Electric Wheel Co. showed its model A Dreadnaught crawler dump trailer with hydraulic-operated bottom dumps. The wagon holds 4 yd. and is fitted with a Commercial Shearing & Stamping tractor pump unit. Three trailer dump wagons on Athey truss wheels, roller-bearing equipped, were shown by Athey Truss Wheel Co. These included a 6-yd. 10-ton three-way dump; a similar model in the 8-yd. 15-ton size; and the hopper-type dump trailer, 14-yd. 20-ton size. Trail-It Co. showed a 3½-yd. bottom-dump trailer on two wheels, hooked to a McCormick-Deering 10-20 tractor fitted with Trail-It crowned rear wheels 42 in. in diameter and having a 20-in. face.

LaPlant-Choate Mfg. Co., Inc., showed two dump wagons, one 7-yd. with hydraulic lift on front and hand lift on rear and one 8-yd. three-way dump on crawler treads. Shunk Mfg. Co. displayed a new Camel automatic dump 5-yd. wagon on a McCormick-Deering 10-20 tractor, equipped with a bulldozer on front.

Special Trailers

Three heavy-duty transport trailers were on the floor. Rogers Bros. Corp. showed the Rogers Gooseneck 25-ton level-deck trailer equipped with two solid-rubber-tired wheels in front and a special tandem arrangement of four rocker wheels in the rear. G. H. Williams Co. exhibited a 28-ton arch-girder trailer with two wheels in front and four in the rear in one line. The trailer is equipped with air and hand brakes. The third heavy-duty trailer was shown by Chas. Hvass & Co., Inc. Hvass also showed a spreader attachment for dump trucks, fitted to a Wood dump body on an International truck.

Light Locomotives

Locomotives—Only two makes of locomotives were shown. Brookville Locomotive Co. exhibited a new model 8-ton gas-driven locomotive, equipped with roller bearings. It is 36-in. gage and is powered by a McCormick-Deering unit. Midwest Locomotive Works showed an 8-ton model, 36-in. gage, Hercules powered, and a 16-ton 36-in. gage model, Climax powered. Midwest announced a new 25-ton eight-speed gasoline locomotive with a 200-hp. engine, but did not have it on display.

Hoists and Cableways—Sauerman Bros. showed a two-drum hoist powered by a Waukesha unit for handling a ¾-yd. scraper. Sauerman exhibited a Crescent ¾-yd. scraper bucket and working models of a slackline cableway and a drag scraper outfit. Pioneer Gravel Equipment Mfg. Co. showed a new Pioneer dragline hoist on a Caterpillar 60 tractor, power-takeoff operated, and a 1-yd. dragline bucket and a tail sheave. Iowa Mfg. Co. displayed a 1-yd. drag scraper. A Trackson hoist on an Allis-Chalmers crawler tractor and a separate Trackson hoist drum were shown by Trackson Co.

Power Units

Engines—Few diesel and oil engines were on exhibition. Cummins Engine Co. showed three oil engines, one 16-hp. direct-connected to a Westinghouse 10-kw. generator. Cummins showed a new 4-cylinder truck and tractor-type oil engine rated at 40-60 hp. at 1,000-1,500 r.p.m., and a 4-cylinder 100-hp. oil engine for shovels and locomotives. Waukesha Motor Co. displayed a 100-hp. 4-cylinder diesel power unit, a new 6-cylinder 8½x8½ gas engine weighing 5 tons and rated at 300 hp., and a new 6-cylinder gas power unit, 60 hp. Buda Co. showed two diesel engines, one on a power unit, a 4-cylinder 6½x8¾ four-cycle full diesel engine rated at 120 hp., and a 180-hp. diesel engine. Buda also exhibited two 4-cylinder and one 6-cylinder gas engines and a 4-cylinder and a 6-cylinder power unit.

Hercules Motors Corp. displayed a new model HXC 6-cylinder 5¼x6 industrial gas engine, and a new HXD 6-cylinder 5½x6 engine. Other engines showed by Hercules included three 4-cylinder and two 6-cylinder models, and four 4-cylinder and one 6-cylinder power units complete with radiator, transmission and hood. Hercules also showed a parts board.

Wisconsin Motor Co. showed a 6-cylinder 5¼x6½ engine rated at 105 hp. and two small air-cooled engines, 1½ and 3½ hp. International Motor Co. showed two Mack truck engines, demonstrator models, in 100- and 75-hp. sizes, both 6-cylinder. LeRoi Co. displayed its model WP7 4-cylinder gas engine.

Small farm-type engines were shown by Stover Engine & Mfg. Co. in 2- and 3-hp. sizes, the latter as a radiator-cooled power unit; and by Hercules Products, Inc., in 2-, 3½- and 6-hp. sizes. Minneapolis-Moline Power Implement Co. exhibited a heavy-duty 95-hp. 4-cylinder valve-in-head engine, a 50-hp. 4-cylinder engine and a 25-hp. 4-cylinder power unit.

Continental Motors Co. introduced a new small 6-cylinder power unit, 3⅛x4 rated at 40 hp., equipped with a gear on the front end. Continental also showed its DeLuxe heavy-service 4-cylinder 5¼x6½ engine, rated at 88 hp. and fitted with removable sleeves, overhead valves and dry-sump lubrication, and a 4⅛x4¼ 4-cylinder engine rated at 31 hp. Briggs & Stratton Corp. showed a line of small air-cooled gas engines from ½ to 2½ hp. One was a 2-hp. all-aluminum engine for portable broadcasting units. Two were direct-connected to Westinghouse generators.

CONSTRUCTION NEWS

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AIRPORTS

BIDS ASKED

Conn., New Haven—Jan. 30, by City, Municipal Airport Comn., City Hall, airport buildings, incl. administration, fire house, field storage and light buildings, all brick, Morris Cove, to exceed $40,000, Westcott & Mapes, 139 Orange St., archts., and L. J. A. Julianelle, Metropolitan Bldg., engr.; also bids Feb. 2 by City, for flood lights, field lights, beacons and fixtures at above airport. Noted Dec. 4.

N. Y., Brooklyn—Feb. 4, by M. Cosgrove, comr. Docks, Pier A, Battery Pl., North River, administration building, concrete found., Municipal Airport (Floyd Bennett Field), Flatbush Ave. Former bids rejected. Noted Jan. 8.

N. Y., Buffalo—Feb. 5, by G. Fisk, comr. P. Wks., excavating materials between concrete loading platform and New York Central R.R.; constructing concrete loading platform, concrete retaining walls, concrete ramp; 20 and 15 in. vitr. tile sewer, all at Buffalo Marine Airport, foot of Georgia Ave. W. Rathman, city engr.

Bond Elections

Coming Bond Elections

Waterworks—Morton Grove, Ill., $80,000.

Waterworks, Ext.—Ponca City, Okla., Feb. 6, $36,000.

Court House Add.—Reno, Nev., Washoe County, $150,000.

Court House — Wellington, Tex., Collingsworth County, Feb. 14, $175,000.

High School—Pueblo, Colo., Feb. 10, $250,000.

Bonds Voted

Waterworks — Palo Alto, Calif., Santa Clara County Waterworks Dist. 1, $27,500.

Waterworks Ext. — Haskell, Okla., W. F. McMurry, 15 W. 7th St., Tulsa, Okla., $45,000.

Waterworks—Pierre, S. D., R. Baker, City Engr., $38,000.

Waterworks Pumping Unit, Mains, etc.—Tenaha, Tex., $35,000.

Irrigation — Yuma, Ariz., Mohawk Municipal Water Conservation Dist., $328,000.

Some of the Week's Large Projects

For further details turn to the appropriate sections in this issue.

Location	*Project*	*Cost*	*Status*
Bridge			
Omaha	Bridge	$1,500,000	Proposed
Excav. and Dredging			
Montreal	Excavation, etc	1,500,000	Contract
Sports and Parks			
Toronto (Ont.)	Arena, etc	1,250,000	Proposed
Unclassified			
Tennessee	Gas pipe line	2,500,000	Proposed
Memphis	Oil tanks, etc	1,000,000	Proposed
Factories and Mills			
Seattle	Assembly plant	1,500,000	Bids asked
Power Plants			
Long Beach (Calif.)	Steam plant	7,500,000	Proposed
Idaho Falls	Hydro electric plant	2,000,000	Proposed
Springfield (Mass.)	Power plant	1,250,000	Proposed
Eagle Pass (Tex.)	Hydro electric plant	1,400,000	Proposed
Buildings			
New York	Apartment	1,000,000	Separate contracts
Brooklyn	Bank add	2,500,000	Contract
Washington	Office	1,000,000	Bids asked
Quincy (Mass.)	Office	1,000,000	Proposed
Detroit	Office	1,000,000	Proposed
New York	Office	1,500,000	Proposed
New York	Office	5,500,000	Proposed
New York	Office	1,200,000	Proposed
Berkeley (Calif.)	University	1,000,000	Proposed
Elsah (Ill.)	College	2,000,000	Proposed
New Orleans	Medical school	1,000,000	Proposed
Boston	University	5,000,000	Proposed
Utica	High school	1,220,000	Proposed
Oakland (Calif.)	Store	1,000,000	Proposed
Indianapolis	Telephone exchange	1,000,000	Proposed

BRIDGES

PROPOSED WORK

Neb., Omaha — C. B. Moriarty, 700 Peters Trust Bldg., bridge in South Omaha. $1,500,000. Ash, Howard, Needles & Tamem, 1012 Baltimore Ave., Kansas City, Mo., engrs.

BIDS ASKED

Calif., Santa Rosa — Feb. 18, by State Hy. Comn., Sacramento, six 19 ft. and two 16 ft. 10½ in. span timber, concrete bridge on pile bents, also grading, concrete paving approaches over Mark West Creek, 4.5 mi. north of here, Santa Rosa, Sonoma Co. C. H. Purcell, hy. engr.

Ind., Michigan City—Mar. 1 (extended date), by Bd. Comrs. Laporte Co. (Laporte) bascule bridge, Franklin St. $300,000. E. Alexander, Laporte, engr. Noted Jan. 1.

Md., Wells — Jan. 28, by State Hy. Dpt., Augusta, Buffam, Capell and Donnells Bridges, concrete. To exceed $25,000.

Michigan — Feb. 4, by J. T. Sharpensteen, div. bridge engr., Escanaba, F. A. Br. 1 of 36-5-12, Contr. 2 and 3, 2 rein.-con. abutments, steel deck girder, Iron Co., for State Hy. Comn., Lansing.

New York—Feb. 3, by W. G. Hickman, comr. Erie Co., 29 County Hall, Buffalo, 18 x 24 ft. concrete slab bridge on Concord Rd., C.R. 414, Concord—10 x 24 ft. concrete slab bridge on Three Rod Rd., C.R. 354, Marilla—concrete culvert, earth filled, 8 x 6 x 81 ft. on Hayes Hollow Rd., C.R. 397 Colden—5, 7 and 10 ft. concrete slab bridges, on Creek Rd., C.R. 387, Wales—steel plate girder bridge, 24 x 70 ft. roadway, over Murder Creek, on Swifts Mills Rd., C.R. 255, Newstead. G. C. Diehl, 577 Ellicott Sq., Buffalo, co. engr.

Oklahoma—Feb. 3, by State Hy. Dpt., Oklahoma City, 1 span 140 ft. steel truss bridge on concrete piers at Stigler, Haskell Co. $32,000—7 span 102 ft. rein.-con. bridge at Nash, Grant Co. $25,000—7 span 88 ft. concrete bridge, rein.-con. trestle, at Fisher, Tulsa Co. $26,000—8 span 114 ft. concrete bridge, rein.-con. trestle at Hopeton, Woods Co. $27,500—2 span, 240-ft. steel truss bridge on concrete piers over Cache Creek, near Lawton, Comanche Co. $30,000—9 span 126 ft. concrete bridge, rein.-con. trestle, at Cheyenne, Roger Mills Co. $28,000. A. R. Losh, hy. engr.

Okla., Jay—Feb. 3, by G. W. Hogan, clk. Delaware Co., 1 span 100 ft. steel truss and concrete bridge, pile trestle approaches, incl. 8 tons reinforcing steel, 100,000 lin.ft. wood piling. $25,000. C. N. Barnett, Jay, engr.

Tex., Houston—Feb. 9, by Harris Co., c/o H. L. Washburn, aud., 165 ft. span rein.-con. bridge over Bray's Bayou, Main St. Loop, $30,000; 4,464 ft. steel, rein.-con., treated timber bridge over Tabbs Bayou, Goose Creek to Morgan Point Rd., $160,000. C. Haile, Houston, engr.

Tex., Houston—Feb. 18, by City, 200 ft. concrete bridge, McKee St. $125,000. J. Nagle, city engr.

Virginia—See "Streets and Roads."

CONTRACTS AWARDED

Arkansas—State Ry. Comn., Little Rock, 7 bridges in Craighead Co., to Parham Constr. Co., East St. Louis, Ill., $26,759, est. $38,000—3 bridges, Garland Co., to Luten Bridge Co., A.O.U. Bldg., Little Rock, $34,787, est. $28,000—Prairie Co., to Peterson & Earhart, Montgomery, Ala., $147,715, est. $168,000. Grand total, $209,361.

Florida — State Rd. Dpt., Tallahassee, piers, concrete piling for bridge over Suwannee River, Project 67, Rd. 50, Hamilton and Suwannee Counties, to Austin Bros. Bridge Co., 1195 Mickleberry St. S. W., Atlanta, Ga., $47,266. Noted Jan. 1.

Kansas—See "Railways."

Louisiana—See "Streets and Roads."

Maryland — State Roads Comn., Baltimore, G. C. Uhl, chn., 15 span, rein.-con. girder bridge, approaches, complete, except steel girders over railroad tracks for proposed grade elimination at Bare Hills, Contr. B-100-45, Baltimore Co., to Mullan Contg. Co., 3945 Greenmount Ave., Baltimore, $95,797. Noted Oct. 30.

Michigan—H. F. Anderson, division bridge engr., Cadillac, structural steel for MBr. 1 of 28-5-1-1, Contr. 3, 2 rein.-con. abutment, steel, deck girder, Grand Traverse Co., to Fort Pitt Bridge Wks., Massillon, O., $4,960; Contr. 4,

See proposal advertising on page 85

Constr. News page 39

LEADITE

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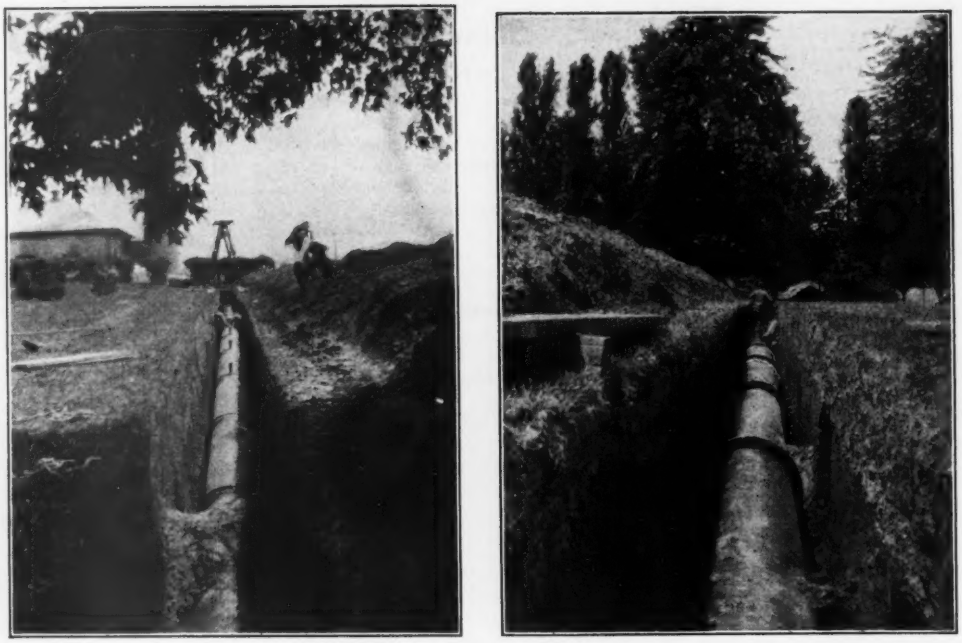

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Bridges (Continued)

incl. cement and aggregates, to L. W. Lamb, Jackson, $66,483, for State Hy. Comn., Lansing. Noted Dec. 25.

Missouri—State Hy. Dpt., Jefferson City, to Neyer Constr. Co., Billings, bridges over Turn Back Creek, Greene Co. West Rd., Lawrence Co., $8,335; over Pickerel Creek, Republic Rd. West, Greene Co. $5,912—to C. I. Williams, Monett, over Big Lost Creek, Through Seneca Rd., $3,675; over Little Creek, Through Seneca Rd., both Newton Co., $2,988—to J. M. Roark, Anderson, over Muddy Fork, Spring River, $14,499; over Branch $1,128; over Heath Branch $4,087; over overflow Muddy River $8,565, all foregoing on Golden City North, Barton Co.; over Kyle Creek, Dade Co., $6,352—to W. K. Ferman & Co., LaPlata, over Rain Creek, $5,470; over Geyer Creek, $1,675 both Nodaway Co.—to R. E. Martin, Cotton States Bldg., Nashville, Tenn., over Mulberry Creek, $4,751; over Mill Creek, $2,512; over Briar Creek, $12,755; over Powder Creek, $5,278, all on Ripley Co.—to Koss Constr. Co., 205 Old Colony Bldg., Des Moines, Ia., over Sloan Branch, $4,546; over Dry Branch, $5,007, both Newton Co.—to Brosnahan Bros., 218 City Bank Bldg., Kansas City, over Chicago, Milwaukee & St. Paul R.R., Clay Co., $13,156; over Platte River, $28,633, both Nodaway Co.—to D. Tanner, Charleston, over Maple Slough, Mississippi Co., $3,215. Grand total $142,539. Noted Dec. 11.

Texas—G. Gilchrist, state hy. engr., Austin, rein.-con. bridges, Childress Co., to R. B. Stroup, Vernon, $28,687, est. $25,000—27 concrete girder spans, 3 encased I-beam span steel, concrete viaduct, approaches, Ellis Co., to Purvis & Bertram, 1124 West 9th St., Fort Worth, $114,361 est. $120,000—steel, concrete, timber pile trestle bridge, 4 relief bridges, Brazos and Madison Counties, and rein.-con. bridge, Waller Co., to Thomas & Ratliff, Rogers, $95,507 and $20,603 respectively est. $100,000 and $25,000 respectively—3 concrete, steel bridges Atascosa Co., to Geo. W. Condon Co., 223 Grain Exch. Bldg., Omaha, Neb., $24,399 est. $28,000—rein.-con., treated timber pile bridges, Nueces Co., to F. P. McElwrath, Box 727, Corsicana, $10,416 est. $25,000—16 span, steel, concrete bridge and concrete girder spans, Young Co., to Brown-Abbott Co., Inc., 842 Wilson Bldg., Dallas, $90,452 est. $100,000. Grand total, $384,425. Noted Jan. 8 and 15.

West Virginia—State Roads Comn., Charleston, superstrutures Beckner Bridge 1220, Ritchie Co., to R. Zando, Williamson, $12,941—Davis Bridge 1213, Tucker Co., to N. H. Clark, Luray, Va., $13,350—Ceredo Bridge 1212, Wayne Co., to West Virginia Bridge Co., Spencer, $15,518. Grand total $41,809. Noted Jan. 1.

EQUIPMENT

PROPOSED WORK

LIGHTED SIGNS—Peoria, Ill.—City furnishing lighted signs for 2,877 street crossings. H. A. Hunt, City Hall, engr.

BIDS ASKED

TRUCK—Holtville, Calif.—Feb. 4, by E. M. Carpenter, city clk., 2 ton truck with hydraulic hoist, dual wheels on rear.

TRACTOR, etc.—Madera, Calif.—Feb. 2, by L. W. Cooper, clk. Madera Co., new 35 Monarch tractor f.o.b. Madera, also selling used 30-Best tractor no longer required for county use.

GRADER BLADES, etc.—Iowa—Feb. 3, by State Hy. Comn., Ames, 24,200 lin.ft. ¼ x 6 in. shaped and sharpened grader blades and 10,700 lin.ft. plain ¼ x 8 in. drag line blades, one edge chamfered. C. R. Jones, aud.

RAILROAD CROSSING SIGNS—Iowa—Feb. 3, by State Hy. Comn., Ames, 250 reflector type railroad crossing signs. C. R. Jones, aud.

TRUCK—Fairmont, Minn.—Feb. 4, by W. M. Canfield, aud. Martin Co., 1 truck, 1 trailer, 1 grader.

ELECTRICAL SWITCHBOARD — Duquesne, Pa. — City Water Dpt. in market electrical switchboard. $900.

TURBINE GENERATOR—Berea, O.—City, c/o T. R. Barmun, in market 1,000 kw. turbine generator.

SCHOOL EQUIPMENT—Erie, Pa.—Bd. Educ., R. S. Scobell, secy., Library Bldg., in market woodworking equipment, metal working equipment, auto mechanic and other technical equipment in Technical High School. Myers & Johnson, 821 Commerce Bldg., archts.

SUB-STATION and PUMPING STATION EQUIPMENT—Erie, Pa.—Erie County Electric Co., 12th and French Sts., P. S. Sturtevant, engr. in charge, in market equipment for sub-station addition $5,000; transformers, other equipment for power line to water and pumping station (now under construction).

ROAD MAINTAINERS—San Antonio, Tex.—Feb. 9, by Comrs. Bexar Co., c/o W. A. Wurzbach, judge, 1 or more crawler type power pull type road maintainers; 35 to 50 hp. tractor, equipped with electric starter and lights. W. S. Goodwin, c/o Court House, co. engr.

EXCAVATION

PROPOSED WORK

Calif., San Francisco—California State Harbor Comn., raising level of Embarcadero sidewalk and bulkhead, average 3 ft. $225,000. F. G. White, Ferry Bldg., engr.

N. J., Trenton—City Comn., bids in February, 1,200 lin.ft. bulkhead along Delaware River, for municipal marine terminal. J. W. Thompson, 506 East State St., engr.

BIDS ASKED

Ill., New Boston—Feb. 6, by Bd. Comrs. Bay Island D. D., at Government Engineers Office, Rock Island, straightening more than 4 mi. Eliza Creek channel so to divert water directly into Mississippi River through Sturgeon Bay; improving, strengthening 1,000 ft. levee along river; several bridges. $390,000.

Nebraska—Feb. 6, by Bd. Trustees Sanitary Dist. 1, 427 Bankers Life Bldg., Lincoln, deepening, widening Salt Creek, west half section 32-11-7, Lancaster Co., incl. 369,948 cu.yd. dry earth excav. Scott & Scott, 427 Bankers Life Bldg., Lincoln, engrs.

N. Y., Babylon—Feb. 5, by Long Island State Park Comn., Administration Headquarters, Belmont Lake State Park, 450,000 cu.yd. hydraulic excavation and placing 1,850,000 cu.yd. additional along Ocean Blvd. W. E. Andrews, acting ch. engr.; adv. E. N.-R. Jan. 29.

CONTRACTS AWARDED

Calif., Carmichael — R. W. Sullivan, secy. Carmichael Irrigation Dist., 4,300 ft. welded steel pipe, to Western Pipe & Steel Co., 444 Market St., San Francisco, at $0.41 per ft. Noted Jan. 1.

Ill., Kankakee—Bd. Comrs. Grinnell Special Drainage Dist., Kankakee Co., at office Gower, Gray & Gower, City Bank Bldg., cleaning out main open ditch, requiring tile branches, constructing 1,455 ft. extension Groenwood Branch, to Streator Drain Tile Co., Streator, L. Mattocks, Kankakee, and R. H. Tanner, Kankakee.

Louisiana—See "Streets and Roads."

Mo., St. Louis—Bd. P. Serv., City Hall, constructing Sect. J, River Des Peres Project, to W. E. Callahan Constr. Co., Arcade Bldg., $603,293. Est. $914,000. Noted Jan. 1.

N. Y., New York—H. P. Swift, chn. Hunter College Lands & Buildings Com. of Bd. Higher Educ., at office Secretary Hunter College, Park Ave. and 68th St., excavating southerly portion site and rough grading around instruction Unit 1, for Hunter College, Bedford Park Blvd., Goulden, Jerome and Navy Aves., to Remo Eng. Co., 645 Tremont Ave., $34,500. Noted Jan. 8.

N. Y., New York—M. Cosgrove, comr. Docks, Pier "A", Battery Pl., North River, dredging between Piers 56 and 62, North River, Contr. 2018, to H. DuBois Sons, 17 State St., $17,325 and $61,325. Noted Jan. 15.

O., Akron—Comrs. Summit Co., dredging, widening, straightening 8,700 ft. Mud Run, from Tuscawaras River to Norway Ave., to Louis Crano, Inc., 206 Crosby St., $28,010. Est. $34,000. Noted Jan. 8.

Que., Montreal—Terminal Architects and Engineers, University Tower, excavating and concrete work Montreal passenger terminal site, to Northern Constr. Co., & J. W. Stewart, 605 Confederation Bldg., for Canadian Natl. Rys., C. B. Brown, ch. engr. Est. $1,500,000. Noted Dec. 25.

FEDERAL GOVERNMENT

PROPOSED WORK

Florida and Texas—DREDGING—U. S. Eng. soon takes bids dredging waterway from Pensacola Bay to Perdido Bay, at east end Pensacola-Mobile Canal.

Ind., Lafayette—POST OFFICE—Treas., Dpt. at office Sup. Archt., revised plans 2 story, basement, 115x130 ft., U. S. Post office. Former bids rejected. Noted Oct. 2.

Tex., Fort Worth — POST OFFICE — Treas. Dpt. at office Sup. Archt., soon takes bids post office, 105,000 sq.ft. floor space, near Texas & Pacific Passenger Station, Wyatt C. Hedrick, Inc., 1st Natl. Bldg., archt. Noted Nov. 27.

BIDS ASKED

Ala., Montgomery—HOSPITAL—Feb. 20, at office Con. Q. M., Maxwell Field, hospital and detachment barracks, fire station and guard house, 1 post exchange, at Maxwell Field; adv. E. N.-R. Jan. 22.

Ala., Montgomery—MACHINE SHOP—Feb. 17, by Con. Q. M., machine shop, assembly building, for Air Corps., Maxwell Field; adv. E. N.-R. Jan. 29.

Ark., Little Rock—CLINICAL BUILDING, etc.—Mar. 16, by Vet. Bu., Arlington Bldg., brick, rein.-con. clinical and reception buildings for U. S. Veterans Hospital, Fort Root. Noted Jan. 22.

D. C., Wash.—STEEL TANK—Jan. 30, by A. L. Flint, genl. purch. officer Panama Canal, elevated steel tank, Schedule 2624.

D. C., Wash.—TRANSMISSION TOWERS—Feb. 11, by A. L. Flint, general purch. officer Panama Canal, structural steel transmission towers, Schedule 2625.

Fla., Pensacola — Spec. 6287 — Feb. 4, by Yards & Docks, Navy Dpt., pavements.

Idaho, Caldwell—POST OFFICE—Mar. 6, by Treas. Dpt. at office Sup. Archt., U. S. Post Office; adv. E. N.-R. Jan. 29 Noted July 17

Ill., Waukegan—PIER—Feb. 18, by U. S. Eng., rebuilding 612 ft. concrete superstructure on North Pier; adv. E. N.-R. Jan. 29.

Ky., Madisonville—POST OFFICE—Feb 26, by Treas. Dpt. at office Sup. Archt., U. S. Post Office; adv. E. N.-R. Jan. 29.

Me., Brunswick — POST OFFICE — Feb. 18, by Treas. Dpt. at office Sup. Archt., U. S. Post Office.

Mass., Springfield—POST OFFICE—Feb. 16 (extended date), by Treas. Dpt. at office Sup. Archt., U. S. Post Office, Lyman, Dwight and Taylor Sts. Noted Jan. 1.

Mass., Taunton—POST OFFICE—Feb. 25, by Treas. Dpt. at office Sup. Archt., U. S. Post Office; adv. E. N.-R. Jan. 29. Noted Dec. 11.

Mo., Sikeston—POST OFFICE—Feb. 16, by Treas. Dpt. at office Sup. Archt., U. S. Post Office.

N. J., Metuchen—HOSPITAL—Feb. 27, at office Con. Q. M., 39 Whitehall St., New York, hospital at Raritan Arsenal; adv. E. N.-R. Jan. 29.

N. Y., Buffalo—BREAKWATER, etc.—Feb. 6, by U. S. Eng., 1,800 lin.ft. stone seaslope on lake side south breakwater; dredging 355,000 cu.yd. sand, clay, mud from Areas H, I and K, outer Buffalo Harbor.

N. Y., Fort Plain—POST OFFICE—Feb. 12, by Treas. Dpt. at office Sup. Archt., U. S. Post Office.

N. Y., New York—DREDGING—Feb. 16, by U. S. Eng., Army Bldg., 39 Whitehall St., 46,000 cu.yd. in Harlem River; adv E. N.-R. Jan. 29.

N. Y., Oswego—BREAKWATER—Feb. 10, by U. S. Eng., Buffalo removing light house and 2,485 lin.ft. breakwater and constructing 2,700 lin.ft. rubble mound west arrow-head breakwater with pierhead at lakeward end, incl. found. for lighthouse, Oswego Harbor. Noted Dec. 18.

N. Y., Sodus—DREDGING—Feb. 3, by U. S. Eng., Buffalo, 13,300 cu.yd. in entrance channel, in Lake Ontario, Great Sodus Bay Harbor.

N. C., Edenton—POST OFFICE—Feb. 13, by Treas. Dpt., at office Sup. Archt., U. S. Post Office.

O., Cincinnati—REMODELING, etc.—Feb. 5, by Treas. Dpt. at office Sup. Archt., remodeling, enlarging U. S. Post Office. Noted June 5.

O., Lorain—DREDGING, etc.—Feb. 18, by U. S. Eng., Buffalo, dredging 150,000 cu.yd. and removing 1,500 old piles from Black River at Lorain Harbor, above Erie Ave. Bridge.

Okla., Bartlesville—POST OFFICE—Feb. 24, by Treas. Dpt. at office Sup. Archt., U. S. Post Office.

R. I., Warren—POST OFFICE—Feb. 17, by Treas. Dpt. at office Sup. Archt., U. S. Post Office. Noted Dec. 4.

Tex., Randolph Field—QUARTERS—Feb. 1, by Con. Q. M., 11 field officers quarters, H. S. Green, Alamo Natl. Bank Bldg., San Antonio, archt. W. E. Simpson Co., Milam Bldg., San Antonio, engr. Noted Jan. 26 Daily.

Va., Langley Field—SEAWALL—Feb. 12, at office Con. Q. M., Fort Monroe, seawall and fill at Langley Field; adv. E. N.-R. Jan. 29. Noted Dec. 11.

T. H., Schofield Barracks—QUARTERS—Feb. 16, by Con. Q. M., married officers and non-commissioned officers quarters.

CONTRACTS AWARDED

California—PILING—U. S. Eng., Sacramento, grading (treated timber piling) 7.99 mi. Quincy-Beckwith Natl. Forest Hy., Plumas Co., to C. Harlowe, Jr., 378 Belmont St., Oakland, $64,413. Noted Jan. 15.

California—ROAD—C. H. Sweetser, dist. engr. Pub. Rds., 461 Market St., San Francisco, grading Laguna Natl. Forest Hy., Sects. A and B, Route 73, San Diego Co., to Triangle Rock & Gravel Co., San Bernardino, $32,714. Noted Nov. 13.

Conn., New Haven—DREDGING—U. S. Eng., Providence, R. I., 196,900 cu.yd. in New Haven Harbor, to Morris & Cummings Dredging Co., 15 Moore St., New York, $37,174. Noted Jan. 1.

Kan., Wolcott—REVETMENT—U. S. Eng., 707 Postal Telegraph Bldg., Kansas City, 6,600 ft. standard revetment, at Weavers Bend 1.6 mi. from here, to Woods Bros. Constr. Co., 132 South 13th St., Lincoln, Neb., $94,000. Noted Dec. 4.

Louisiana—BRIDGE — U. S. Eng., New Orleans, substructure single track railroad bridge at Bayou Sale Branch, to Soule Contg. Co., Pensacola, Fla., $20,220; superstructure, to Petroleum Iron Wks., Island Park, Beaumont, Tex., $68,692. Noted Nov. 13.

Me., Portland—FOUNDATION—Treas. Dpt. at office Sup. Archt., foundation for court house extension, to Monitor Constr. Co., 187 Middle St., $7,385. Noted Jan. 8.

Miss., Kosciusko—POST OFFICE—Treas. Dpt. at office Sup. Archt., U. S. Post Office, to A. Blair, 1st Natl. Bank Bldg., Montgomery, Ala., $43,437. Noted Nov. 20.

New Jersey — DREDGING — U. S. Eng., 39 Whitehall St., New York, 62,107 cu.yd. overlying material and 72,182 cu.yd. ledge rock in Raritan River, to G. H. Breyman, 17 Battery Pl., New York, $159,810. Noted Jan. 8.

Pa., Warren—FOUNDATIONS—Treas. Dpt. at office Supr. Archt., foundations for U. S. Post Office, to Ortman & Dreher, 2126 Francis St., Flint, Mich., $20,400. Noted Jan. 1.

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Federal Government (Continued)

Texas—JETTY—U. S. Eng., Galveston, repairing west jetty Sabine Pass, to Pacific Co., Inc., Galveston, $106,000. Noted Oct. 9.

Va., Hampton Roads—BARRACKS—Spec. 6336—Yards & Docks, Navy Dpt., barracks at U. S. Naval Operating Base, to Worsham Bros., Medical Arts Bldg., Knoxville, Tenn., $478,290. Noted Jan. 1.

FOREIGN

New Zealand, Wellington—Mar. 19, by Secretary Post & Telegraph Dpt., 300 indicator alarm fuses; Mar. 31, 200 mounted 5 conductor cords and 300 five conductor cords for operator sets.

New Zealand, Wellington—Apr. 9, by General Manager New Zealand Government Railways, transformers, armoured cable, instrument transformers, cable boxes, instruments, static condensers, isolating links for Elmer Lane Engine Dpt.

New Zealand, Wellington—Apr. 14, by Secretary P. Wks. Dpt., 43333 kva. transformers, incl. Buchholz relays spares; until May 5. 66 and 33 kv. outdoor switch gear and steel work.

GRADE CROSSINGS

PROPOSED WORK

Calif., Palo Alto—City and Southern Pacific R.R. Co., 65 Market St., San Francisco, G. W. Boschke, ch. engr., surveys 3 subways under railroad, one at Embarcadero Rd., one at University Ave., other at California Ave. $811,500. J. F. Byxbee, city engr.

BIDS ASKED

Calif., Santa Ana—Feb. 9, by City Council, rein.-con. grade separation structure, incl. 22,400 cu.yd. excav., 3,181 cu.yd. concrete, 1:3:6, 1:2:4, 1:2:3½ and 1:1½:3 mix, 168 ft. false work under track, 202,700 lb. reinforcing and 307,100 lb. structural steel, also pumping plant, lighting system. $150,000.

Tex., Marshall—Texas & Pacific R.R., E. F. Mitchell, ch. engr., Dallas, and City taking bids 140 ft. concrete, steel underpass, 24 ft. wide over North Grove St. $30,000. Noted Jan. 8.

Ont., Breslau—Feb. 4, by T. T. Irving, ch. engr. (Central Region) Canadian Natl. Rys., New Union Sta., Toronto, concrete, steel subway under Canadian Natl. Ry. tracks, on Hy. 7, near here. $30,000.

Ont., Hamilton—Feb. 11, by Toronto, Hamilton & Buffalo Ry. Co., Hamilton, R. L. Latham, ch. engr., James and Hunter Sts., grade crossings, subways. Fellheimer & Wagner, 155 East 42nd St., New York, engrs. Noted Jan. 15.

CONTRACTS AWARDED

Tex., Fort Worth—Texas & Pacific Ry. Co., E. F. Mitchell, ch. engr., Dallas, rein.-con., steel underpass, Jennings Ave. to Butcher & Sweeney, 806½ Taylor St., $221,460. Est. $560,000. Noted Jan. 1.

HEATING AND VENTILATING

BIDS ASKED

Ind., Terre Haute—Feb. 3, by Bd. Directors Indiana State Teachers' College Bd., at office President of Faculty of State Teachers College, flow meters, panel board for instrument mounting, automatic feed water regulators, pump governors, automatic damper regulators. Address Miller & Yeager, 819 Ohio St.

MATERIALS

PROPOSED WORK

FIRE HYDRANTS—**Pueblo, Colo.**—Trustees Pueblo Waterworks, c/o D. L. Porter, supt., 319 West 4th St., buying, installing 25 non-freezing fire hydrants.

BIDS ASKED

COVERED WIRE—**Beverly Hills, Calif.**—Feb. 10, by City Council, 33,000 ft. lead covered wire for street dpt.

PIPE—**Coalinga, Calif.**—Feb. 16, by E. McCroskey, city clk., furnishing pipe—delivering 5,000 ft. 1 in. black merchant pipe.

PORTLAND CEMENT, etc.—**Whittier, Calif.**—Feb. 9, by D. E. Allen, city clk., 9,000 to 10,000 sacks portland cement, 1,000 tons sand, 1,800 tons gravel.

ROAD OIL—**Waterford, Conn.**—Town, Bd. Selectmen in market road oil. $8,500 appropriated.

ALUMINUM SULPHATE—**Evansville, Ind.**—Feb. 12, by Bd. Trustees Water Works Dpt., 350 tons aluminum sulphate ground in granulated form for water purification purposes, shipped in 200 lb. sacks, f.o.b. Evansville. W. J. Foley, secy.

BITUMINOUS MATERIALS, etc. — **Iowa** — Feb. 3, by State Hy. Comn., Ames, 5,160 bbl. bituminous crack filler for maintenance cracks in concrete pavements, also 125 bbl. bituminous materials for cold patch work. C. R. Jones, aud.

CULVERT PIPE, BRIDGE LUMBER, etc.—**Centerville, Ia.**—Feb. 3, at office Auditor Appanoose Co., corrugated culvert pipe, standard sawed fir bridge lumber, creosoted piling, nails, paint and hardware.

LUMBER, PILING, etc.—**Denison, Ia.**—Feb. 5, at office Auditor Crawford Co., 10 cars bridge lumber, 5 cars creosoted yellow pine piling, also 15, 18, 24, 30 and 36 in. corrugated culvert pipe.

PILING, POSTS, etc.—**Newton, Ia.**—Feb. 3, at office Auditor Jasper Co., 2 cars piling, 7 cars standard sawn fir lumber, 1 car white cedar posts. Address County Auditor or Engineer.

BRIDGE LUMBER and PILING—**Onawa, Ia.**—Feb. 3, at office Auditor Monona Co., 7 cars sawn fir bridge lumber, 4 cars creosoted piling.

BRIDGE LUMBER and PILING—**Osage, Ia.**—Feb. 6, at office Auditor Mitchell Co., 3 cars bridge lumber, 1 car piling, 1 car creosoted piling.

LUMBER, PILING, etc.—**Rock Rapids, Ia.**—Feb. 4, at office Auditor Lyon Co., 42,150 bd. ft. treated yellow pine lumber, 200 lin.ft. 24 in., 400 lin.ft. 18 in. and 1,020 lin.ft. 15 in. culvert pipe, 5,770 lin.ft. treated yellow pine piling, 48,000 bd. ft. rough fir lumber, 3,433 bd. ft. fir sisle, 24,000 bd. ft. red cedar plank.

GRAVEL, LIMESTONE, etc.—**Louisiana**—Jan. 27, by State Hy. Comn., Baton Rouge, washed and screened gravel, 40% sand-clay gravel, reef shell, clam shell, crushed limestone, slag and sand in such quantities required by maintenance department. H. B. Henderlite, hy. engr.

GRAVEL—**Ocean City, N. J.**—Feb. 2, by Bd. City Comrs., City Hall, 1,000 tons Class A gravel for street purposes. $10,000 or more. W. H. Collisson, Jr., city engr.

PAVING SAND—**New York, N. Y.**—Feb. 5, by S. Levy, pres. Manhattan Boro. Municipal Bldg., 3,000 cu.yd. concrete and paving sand; 3,500 cu.yd. coarse aggregate; 4,000 cu.yd. sand grit.

CAST IRON PIPE—**Beaumont, Tex.**—City, c/o P. Millard, mgr., taking bids 50,000 lin.ft. 2 in. screw joint c.i. pipe in 18 ft. lengths. R. C. Black, city engr.

CONTRACTS AWARDED

CAST IRON PIPE—**St. Helena, Calif.**—E. R. Palmer, city clk., 4,000 ft. Class 150 B and S McWayne Pacific c.i. pipe, fittings, to Pacific States Cast Iron Pipe Co., 111 Sutter St., San Francisco, at $0.38 per ft. Noted Jan. 1.

ASPHALT — **Oakland, Calif.** — J. Kimball, secy. East Bay Municipal Utility Dist., 30,000 gal. Grade E hot asphalt, to Heafey-Moore Co., 344 High St., $2,250. Noted Jan. 1.

BRIDGE TIMBER, etc.—**Florida**—State Hy. Road Dpt., Tallahassee, 19,579 M.F.B.M. creosoted bridge timbers and 300 lin.ft. creosoted piling in 25 ft. lengths, f.o.b. barge, Port Washington, for Project 840, Rd. 115, Walton Co., to Pensacola Creosoting Co., Pensacola, $1,417—19,400 gal. T-C-1, prime, f.o.b. cars, Jacksonville Beach, Project 876-C, Rd. 78, St. Johns Co., to American Tar Products Co., Park Towers Apts., Phila., Pa., $2,386—material for Project 803, Road 19, Okaloosa Co. construction, to Standard Oil Co. of Louisiana, 2134 St. Charles Ave., New Orleans, La., $21,840. Grand total $25,643. Noted Jan. 1.

CEMENT — **Louisiana** — State Hy. Comn., Baton Rouge, Portland cement as follows, 2,500,000 bbl., to Lone Star Portland Cement Co., Hibernia Bldg., New Orleans, La., 900,000 bbl., to Oklahoma Portland Cement Co., Denver, Colo., 900,000 bbl., to Arkansas Portland Cement Co., 1,200,000 bbl., to Trinity Portland Cement Co., above at average price $2.20 per bbl., incl. discount; 1,000,000 bbl., to Alpha Portland Cement Co., Easton, Pa., 750,000 bbl., to Marquette Portland Cement Co., Chicago, Ill., 500,000 bbl., to Atlas Portland Cement Co., 134 South La Salle St., Chicago, Ill., 500,000 bbl., to Lehigh Portland Cement Co., Allentown, Pa., 250,000 bbl., to Signal Mt. Portland Cement Co., Chattanooga, Tenn., above at average price $0.63 per bbl., discount on cash payment return sacks. State Hy. Comn. to purchase cement as needed.

SEWER PIPE—**Minneapolis, Minn.**—F. G. Gram, city purch. agt., rein.-con. sewer pipe for season 1931, purchased as needed from Elk River Concrete Products Co., 712 Builders Exch., and from Massey Concrete Products Co., 2429 Northeast Bway., lowest bidders. No contracts let. Noted Jan. 1.

PORTLAND CEMENT, etc. — **Long Island City, N. Y.**—G. U. Harvey, pres. Queens Boro, Queens Subway Bldg., 3,000 bags portland cement, to Washington Bulkley, 700 Kent St., Brooklyn, $1,635; 7,000 cu.yd. embankment to Tully & DiNapoli, Inc., 31-11 Sherman St., Astoria, $2,380; 100,000 asphalt paving blocks, to Hastings Paving Co., 25 Broad St., New York, $9,450; 300,000 gal. oil, to Warner Quinlan Co., 26 Beaver St., New York, $14,850. Grand total $28,315. Noted Jan. 8.

PARKS AND SPORTS

PROPOSED WORK

Ont., Toronto—Maple Leaf Hockey Club, 13 King St. W., hockey arena and show building, 12,000 seating capacity, also brick, steel, concrete artificial ice plant, in vicinity Yonge and Fleet Sts., or Yonge and Carleton Sts. $1,250,000. Architect not selected.

BIDS ASKED

Ark., Little Rock—Feb. 7, at office Thomason, Sanders & Ginocchio, archts., 219 Hall Bldg., auditorium, recreational building, open air swimming pool for Camp Pike Honorary Commission for use of Arkansas State Guard.

N. J., North Long Branch—H. I. Brandt, archt., 191 Bway., Long Branch, bids about Apr. 1, general contract 1 story, basement, brick, steel bathing pavilion, Ocean Ave., for S. A. McNair, 388 Ocean Ave. $150,000. Noted Dec. 25.

N. Y., Brooklyn—Feb. 2, by W. C. Martin, archt. and supt. School Buildings, Flatbush Ave. extension and Concord St., excavating, paving, fencing, sanitary work and drainage, etc., at playgrounds adjoining P. S. 115, 186, 206 and Franklin K. Lane High School (P. S. 85), for Bd. Educ., 500 Park Ave., New York.

N. Y., Brooklyn—Dpt. Parks, W. R. Herrick, pres. Park Dpt., Arsenal Bldg., Central Park, N. Y., bids about Mar. 1, general contract menagerie, Prospect Park. $50,000. H. G. Harrington, 311 100th St., archt. Noted Jan. 8.

N. Y., West New Brighton—Feb. 2, by W. C. Martin, archt. and supt. School Buildings, Flatbush Ave. extension and Concord St., Brooklyn, retaining walls, grading, paving, fencing, plumbing, drainage, for playground adjoining P. S. 18, Market St. from Bway. to Campbell Ave., for Bd. Educ., 500 Park Ave., New York.

CONTRACTS AWARDED

Ill., Champaign—Holabird & Root, archts., 333 North Michigan Ave., Chicago, general contract 1 story, basement, 196x209 ft., 1,300 seating capacity, brick, steel trusses, stone ice skating rink, plain found., to Trimmer-Nydele Co., 111 West Washington St., Chicago, plumbing and heating, to A. W. Murray Co., Hoopeston, electric wiring, to Hatfield Electric Co., 470 West Van Buren St., Chicago, for University of Illinois. Est. $200,000. Noted Jan. 1.

Mass., Braintree—A. C. Burnett, 145 Waban Ave., Newton, 9 hole golf course, to J. W. Bishop Co., 109 Foster St., Worcester. Est. $30,000.

PIERS AND WHARVES

CONTRACTS AWARDED

La., New Orleans—SHED—Dock Bd., Port of New Orleans, 530 tons steel framing and erection Mandeville Street Wharf, to Worden-Allen Co., Milwaukee, Wis., at $63 per ton. Noted Jan. 8.

POWER AND LIGHTING

BIDS ASKED

Calif., Santa Ana—See "Grade Crossings."

Tex., Yoakum—Feb. 6, by City, c/o E. S. Winfrey, mayor, light and power system, incl. complete distribution system, power plant building, cooling tower, fuel oil tanks, power and auxiliary equipment. Montgomery & Ward, Harvey-Snider Bldg., Wichita Falls, engrs. Noted Dec. 25.

CONTRACTS AWARDED

N. J., Atlantic City—Atlantic City Electric Co., Atlantic Ave., will lay electric wires underground, constructing conduits, manholes, vaults, cables. $25,000 or more. Owner builds. Private plans.

RAILWAYS

CONTRACTS AWARDED

Illinois—Chicago, Burlington & Quincy R.R. Co., 257 West Jackson Blvd., Chicago, A. W. Newton, ch. engr., steel rails to be used in western states, 17,200 tons, to Colorado Fuel & Iron Wks., Pueblo, Colo.; 13,000 tons, to Illinois Steel Co., 208 South La Salle St., Chicago; 6,000 tons, to Inland Steel Co., 33 South Dearborn St. Chicago. Est. $1,500,000.

Kansas—Missouri Pacific R.R. Co., Missouri Pacific Bldg., 13th and Olive Sts., St. Louis, Mo., E. A. Hadley, ch. engr., grading, culvert construction in revising 30 mi. grade, from Delavan to Gypsum, to List Constr. Co., 413 Railway Exch. Bldg., Kansas City, Mo.; bridge work, to Industrial Constr. Co., Title Guaranty Bldg., St. Louis, Mo.

Texas — Emery, Peck & Rockwood Development Co., Burnet, 5 mi. standard gage railway from dam site to Southern Pacific R.R. $100,000. Private plans. Work probably will be done by day labor.

British Columbia—Canadian Pacific Ry., J. M. R. Fairbairn, ch. engr., Montreal, Que., regrading 25 mi. main line from Savona to Spence's Bridge, to Campbell Constr. Co., Calgary, Alta., $250,000. Most of work to be done by owner. Total $750,000.

SEWERS

PROPOSED WORK

Ill., Chicago—Bids in spring system 24 in. tile to 11 ft. brick sewers in Glenwood Ave. from Lawrence to Birchwood Aves., Magnolia Avenue Sewer $3,598,000; Forest Reserve system of sewers at Addison Heights, incl. 5.5 mi. 1¾ ft. tile to 9 ft. brick pipe, $1,032,000;

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Sewers (Continued)

Mt. Greenwood system of sewers being Pioneer system and relief sewer, incl. 7 mi. 24 in. tile to 8½ ft. brick pipe, $1,198,000. A. J. Schafmayer, City Hall, engr. Noted Feb. 21 and May 23, 1929.

BIDS ASKED

Calif., Los Angeles — J. Singer, engr., 112 North Main St., taking bids automatic sewage pumping plant, incl. 90 ft. lift or head with 475 ft. line for Hillcrest Country Club.

Calif., Los Angeles—Feb. 2, by Bd. Supervs. Los Angeles Co., County Impvt. 928-Hanover St., et al., incl. 26,000 ft. 8 in. main sewer, 2,700 ft. 8 in. and 870 ft. 10 in. vitr. sewer with concrete cradle, 450 ft. 12 in. and 230 ft. 12 in. vitr. sewer, 22,600 ft. 6 in. vitr. house connections.

Calif., Modesto—See "Contracts Awarded."

N. Y., Brooklyn—Feb. 4, by H. Hesterberg, pres. Brooklyn Boro, Boro Hall, storm water and sanitary sewers in West 12th St.; sewer in East 52nd St.; sewer basin at Bway. and Grove St.

N. Y., Elmsford—Feb. 2, by Village Clerk, 1 mi. 15-18 in. vitr. sewer in White Plains-Tarrytown Rd. Denehy & Clarke, Peoples Natl. Bank Bldg., White Plains, engrs.; adv. E. N.-R. Jan. 29.

R. I., Providence—Feb. 2, by Bd. Contr. & Supply, sewers in Reservoir, Slater, Basswood and Elmcrest Aves., Magellan, Sheffield and Hooker Sts. $25,000 or more.

S. D., Arlington—Feb. 2, by S. C. Ness, city aud., 8,700 ft. 12 in., 14,000 ft. 8 in. sewer, 51 manholes, sewage disposal plant with tank and rock. W. E. Buell & Co., Insurance Exch. Bldg., Sioux City, Ia., engrs.

Va., Richmond — Feb. 2, at office Dpt. P. Wks., City Hall, sewer projects and 4,580 ft. 27- to 54-in. rein.-con. pipe, and constructing terra cotta or reinforced precast sewer pipe.

CONTRACTS AWARDED

Calif., Los Angeles—Los Angeles Co. Sanitation Dist. 2, two sludge digestion tanks, pump, boiler house, gas tank, appurtenant structures, to F. F. Greenfield Co., 1808 West 7th St., $106,070. Noted Jan. 8.

Mich., Detroit—Dpt. P. Wks., reconstructing 180 ft. additional section of original Sect. 2, Southfield Rd. Sewer, incl. 12 ft. cylinder, 16 in. walls, to S. A. Healy, 6561 East Seven Mile Rd., $159,500.

New Jersey—Bd. Town Council, Town Hall, West Orange, sewers in various streets serving municipalities in Union and Essex Counties, to A. DiMarco, White Plains, N. Y., $254,266. Noted Oct. 9.

N. Y., Brooklyn—H. Hesterberg, pres. Brooklyn Boro, Boro Hall, sewer in Avenue P, to S. Guerriero, 1024 66th St., $150,308. Noted Jan. 8.

O., Cleveland—City, Walworth Run sewer, to Gallagher-Burke Co., 19,940 Roslyn Dr., $82,522. Noted Jan. 8.

O., Columbus—Franklin Co., F. L. Donnally, clk., constructing sanitary sewer in Dist. Franklin 1, Impvt. 75, incl. 4,880 ft. 24 in. and 165 ft. 8 in. concrete pipe, 3,000 ft. 6 in., 815 ft. 18 in., 6,525 ft. 21 in. and 1,430 ft. 24 in. vitr. pipe, 18 manholes, 3,000 ft. 4 in. vitr. subdrain, to Connelly Bros., Infirmary Rd., $143,-110. Est. $175,000. Contract awarded in December.

Pa., Phila.—Dpt. P. Wks., Bureau Eng. & Surveys, City Hall Annex, A. Murdock, dir. branch sewers in Berks St. from 9th to 11th Sts., to J. Hastie, 5720 Virginian Rd., $15,841; Lincoln Ave., from Wayne to Carpenter Sts., to Pandom Constr. Co., 1106 North 41st St. $2,337; Master St., from 2nd to Howard Sts., to Leva Bros., 104 West Gale St. $11,495; 21st St., from Market to Commerce Sts., to V. Neamand, 628 Levick St. $2,317; Walnut St., from 40th to 41st St., to DeSipio & Vallone, 28th and Wolf St., $7,765; Pennsylvania Avenue Improvement. Contr. 1, to F. A. Canuso & Son, 804 South 12th St. $326,736. Grand total, $366,491. Noted Jan. 1.

STREETS AND ROADS

BIDS ASKED

Calif., Los Angeles—Feb. 4, by Bd. P. Wks., City Hall, grading, curbing, guttering, sewers, sidewalks, 8 in. concrete surfacing 175,000 sq.ft. Manchester Ave. between Towne Ave. and St. Andrews Pl.

Calif., Palo Alto—City Council bids about Feb. 9, grading, curbing, sidewalks, 6 in. concrete paving 350,000 sq.ft. Palo Alto Ave., Hale St., et al.

Calif., Santa Ana—Feb. 3, by Bd. Supervs. Orange Co., grading, concrete paving 4,666 cu.yd., gravel base paving 220,500 sq.ft. Westminster Ave., incl. 78,735 sq.ft. gravel shoulders.

Calif, Santa Rosa—Feb. 10, by G. P. Sanborn, clk. Sonoma Co., grading, drainage structures, concrete surfacing 2,465 cu.yd. Petaluma Rd. to Point Reyes Hy.

Ill., Spaulding—Bd. Supervs. Sangamon Co., Springfield, bids early in spring, grading, rein.-con. paving 1.5 mi. hy. from Spaulding to Decatur, 18 ft. $45,000. T. L. Flatt, Court House, Springfield, engr.

Ind., English—Feb. 2, by Bd. Comrs. Crawford Co., rock surfacing Edgar Jennings and Claud Murphy Rds. $28,874. J. Spears, English, aud.

Ind., Marion—Feb. 2, by Bd. Comrs. Grant Co., rock asphalt on stone surfacing Guy Johnson Rd. $54,000. A. J. Green, Marion, aud.

Kentucky—Feb. 25, by State Hy. Dpt., Frankfort, grading, drainage structures 2.6 mi. Carrollton-Warsaw Rd., Federal Aid Project 198-BG, Carroll Co.; 18.1 mi. Corbin-Cumberland Falls Rd., Federal Aid Project 224-AG, Whitley Co. B. Johnson, chn.

Maryland — Feb. 3, by State Roads Comn., Baltimore, G. C. Uhl, chn., graveling 1.44 mi. Contr. SM-79-82, St. Mary's Co.; concrete paving 1.13 mi. Contr. Wo-90-14, Federal Aid Project 225, Worcester Co.

Mass., Malden—See "Contracts Awarded."

Mass., Wakefield—See "Contracts Awarded."

Mass., Winthrop—See "Contracts Awarded."

Nevada—Feb. 4, by State Hy. Comn., Carson City, grading, surfacing 19.68 mi. hy. from west slope Mormon Mesa to Lower Virgin River Bridge, Clark Co. S. C. Durkee, state hy. engr.

New York—See "Contracts Awarded."

New York—Feb. 13, by A. W. Brandt, comr. Hys., Albany, improving hy. in Delaware Co.—reconstructing hys., bridges in Cattaraugus, Chautauqua, Delaware, Hamilton, Madison, Montgomery, Oneida, Rockland, Schoharie, Warren Counties; adv. E. N.-R. Jan. 29.

New York—Feb. 20, by A. W. Brandt, comr. Hys., Albany, reconstructing hys., bridges in Allegany, Columbia, Erie, Monroe, Oneida, Ontario, Schuyler and Steuben Counties—improving hys. in Onondaga, Saratoga and Westchester Counties; adv. E. N.-R. Jan. 29.

N. Y., Babylon — Feb. 10, by Long Island State Park Comn., Administration Headquarters, Belmont Lake State Park, paving, underpasses, ramps and plazas, Sect. 3, Ocean Parkway, Suffolk Co. W. E. Andrews, acting ch. engr.; adv. E. N.-R. Jan. 29.

N. Y., Beacon—Feb. 5, by City Council, 525 Main St., rein.-con. paving 3.8 mi. Herbert St., South, North, Wolcott, Blackburn, Howland and Fishkill Aves. A. C. Tillman, comr. P. Wks.

N. Y., Buffalo—Feb. 5, by G. Fisk, comr. P. Wks., grading, filling, protection, paving Harbor Turnpike from northerly limits to northerly approach to viaduct connecting Harbor Turnpike and Ohio St., paving Harbor Turnpike from northerly approach of viaduct connecting Harbor Turnpike and Ohio St. to point 1000 ft. northerly, etc. W. Rathman, city engr.

N. Y., New York—Feb. 5, by S. Levy, pres. Manhattan Boro, Municipal Bldg., installing 12 ft. radius at southeast corner 165th St. and Bway. and at 137 other corners; removing rock on easterly side Riverside Dr. near Dyckman St. Former bids rejected. Noted Jan. 8.

N. Y., Yonkers—Feb. 11, by Westchester Co. Park Comn., 72 West Pondfield Rd., Bronxville, grading, draining Saw Mill River Parkway from Yonkers Ave. to New York State line. J. Downer, Bronxville, ch. engr.; adv. E. N.-R. Jan. 29.

Oklahoma—Feb. 3, by State Hy. Dpt., Oklahoma City, grading, drainage structures 9.21 mi. Nash Rd., U. S. Hy. 64, Grant Co. $30,000—8.4 mi. U. S. Hy. 70, Cotton Co. $32,000—13.8 mi. Welch Rd., U. S. Hy. 73, Craig Co. $42,000—6.61 mi. Clinton Rd., State Hy. 14, Custer Co. $25,000—6.6 mi. Kingfisher Rd., State Hy. 33, Kingfisher Co. $25,000—8.3 mi. Snyder Rd., State Hy. 14, Kiowa Co. $35,000—13.91 mi. Chandler Rd., State Hy. 18, Lincoln Co. $60,-000—11.5 Cheyenne Rd., State Hy. 24, Roger Mills Co. $40,000—10 mi. Frederick Rd., State Hy. 14, Tillman Co. $45,000—7 mi. Bessie Rd., State Hy. 14, Washita Co. $25,000, all above 32 ft. wide. A. R. Losh, hy. engr.

Okla., Oklahoma City — Feb. 3, by M. Peshek, city clk., sheet asphalt paving 7,800 sq.yd. railroad crossings at Bway., Robinson, Harvey and Hudson Sts. $27,000. G. F. Brown, City Hall, engr.

Utah—Feb. 4, by State Rd. Comn., Salt Lake City, grading, draining, graveling 4.589 mi. Victory Hy. between Duchesne and Fruitland, F.A.P. 110-B, Duchesne Co. H. S. Kerr, state engr.

Utah, Salt Lake City—Feb. 4, by City Comrs., City Hall, grading, curbing, guttering, 6 or 8 in. concrete, 2 in. Utah rock asphalt on 6 in. concrete, 2 in. warrenite on 6 in. concrete or 2 in. bituminous on 6 in. concrete paving 7,258 lin.ft. West Temple and 17th South Sts. $85,000. H. Jessen, city engr.

Virginia—Feb. 10, by State Hy. Comn., Richmond, clearing, grubbing, grading, drainage structures, macadam surfacing 4 mi. Route 14, Project F-592-A, Rockbridge Co.—3.2 mi. Route 33, Project F-640-C, Batetouri Co. — 5 mi. Route 33, Project F-675-AC, Frederick Co.—190 ft. bridge, incl. three 30-ft. rein.-con. I-beam spans, 90 ft. low steel truss span, Route 12, Project F-506-B-4, Carroll Co. — 172 ft. bridge, incl. two 45 ft. rein.-con. I-beam spans, 75 ft. low steel truss span, Route 12, Project F-506-B-5, Carroll Co.—42 ft. bridge, incl. 40 ft. rein.-con. beam span, Route 14, Project F-647-B1, Bedford Co. H. G. Shirley, ch. hy. engr.; adv. E. N.-R. Jan. 29.

Washington—Feb. 10, by S. J. Humes, dir. Hys., Olympia, timber sidewalks 372 ft. Portage Creek and South Slough Bridges, near Island School, State Rd. 1, Snohomish Co.—stockpiling 7,000 cu.yd. crushed stone surfacing at Woodard Creek, State Rd. 8, Skamania Co.—grading, crushed stone surfacing 2.5 mi. State Rd. 11, Lind East, Adams Co.—grading, draining 1.2 mi. State Rd. 12, Cone River to Niawaiakum River, F.A.P. 178-C, Pacific Co.

CONTRACTS AWARDED

Arkansas—State Hy. Comn., Little Rock, to G. Garms, Rector Bldg., Little Rock, concrete surfacing 6 mi. road in Clark Co., $54,988, est. $100,000, to J. B. McCrary Eng. Corp., Citizens & Southern Bank Bldg., Atlanta, Ga.; 6 mi. St. Francis Co., $129,264, est. $140,000—to E. W. Baker Co., Perrine Bldg., Oklahoma City, Okla., 12.668 mi. Hempstead Co. $103,481 est. $130,-000; 6.5 mi. Prairie Co., $150,951, est. $160,000—to Hays Constr. Co., Jackson, Tenn., 8 mi. Job 11016 St. Francis Co. $155,356, est. $180,000; 6 mi. Job 11015 St. Francis Co. $118,-616, est. $140,000—to D. H. Dalton, Arkadelphia, 9 mi. Clark Co. $93,534, est. $150,000—6.5 mi. Nevada Co., $65,980, est. $110,000—to J. P. McNulty, Pine Bluff, 6 mi. Lonoke Co. $80,793, est. $100,000; 4.5 mi. Job 11036, Monroe Co. $106,402, est. $120,000—4.5 mi. Job 11037 Monroe Co. $103,286, est. $120,000—to Hartman-Clark Bros. Co., 920 Peoria Life Insurance Bldg., Peoria, Ill., 10 mi. Job 4127 Washington Co. $151,545 est. $170,-000; 10 mi. Job 4128 Washington Co. $228,652, est. $230,000—to D. F. Jones Constr. Co., Little Rock, 4 mi. Lonoke Co. $54,109, est. $70,000; 6 mi. Saline Co. $88,885, est. $110,000; 10.5 mi. Hot Springs Co. $150,044, est. $200,000, grading, drainage structures 7.5 mi. Clay Co. $27,152, est. $40,000—to H. A. Worman, Pittsfield, Ill., 5.5 mi. Lawrence Co. $22,904, est. $30,000. Grand total, $1,885,942. Rejected bids concrete surfacing 4.5 mi. roads in Clark Co.

Calif., Los Angeles—City Council, grading, street lighting, sewers, asphaltic concrete paving Washington St. between Alameda and Figueroa Sts., to Los Angeles Paving Co., 32000 East Vernon St., $220,970.

Calif., Menlo Park—F. Kurtz, city clk., Jan. 13, curbing, guttering grading, emulsified macadam surfacing 670,000 sq.ft. College Ave. et al., from C. W. Wood, P. O. Box 1435, Stockton, $90,026. Noted Jan. 8.

Calif., Oakland—City Council, curbing, guttering, sidewalks, hot oil penetration macadam on 5 in. macadam paving 8th, Fallon Sts., 10th Street Extension, to Hutchinson Co., 1450 Harrison St., $33,065. Noted Jan. 8.

Florida—State Roads Dpt., Tallahassee, improving Korona-Daytona Beach Rd., P. 60-B, Rd. 4, Flagler and Volusia Counties, and single bituminous treating, using sand 76,267 sq.yd. Project 892, Rd. 30, Indian River Co., to F. D. Beasley, Inc., Tampa, $99,788 and $147,-721 respectively — concrete paving, bridging Eight Mile Creek Rd., Project 879-B, Rd. 1, Escambia Co., to Soule Constr. Co., Pensacola, $8,996—grading, concrete paving 69,388 sq.yd. Lakeland-Carters Rd., Project 73-C, Rd. 17, Polk Co., to J. J. Quinn, Inc., 116 Northeast 29th St., Miami, $150,437. Grand total $406,-942. Noted Jan. 1.

Indiana—State Hy. Comn. Indianapolis, grading, drainage structures, concrete surfacing 131,-655 sq.yd. State Rd. 18, Jay and Blackford Counties, to P. B. Putman, Ft. Wayne, $189,-512 est. $250,735; 2,217 sq.yd. Rd. 7, Jefferson Co., to Indiana Paving Road Co., Rochester, $11,290 est. $11,766. Noted Nov. 6.

Indiana—State Hy. Comn., Indianapolis, grading, drainage structures, concrete surfacing, 137,-493 sq.yd. Dubois and Martin Counties, to Foulkes Constr. Co., 705½ Ohio St., Terre Haute, $146,435 est. $212,645; 57,897 sq.yd. Elkhart Co., to Reith-Riley Constr. Co., Goshen, $73,286 est. $101,618. Noted Jan. 8.

Louisiana — State Hy. Comn., Baton Rouge, concrete surfacing 6.8 mi. roads in Jackson Parish, to Roberts Paving Co., Salisbury, Md., $161,672 — grading, drainage structures 16.4 mi. St. Landry Parish, to Brunnell & Mack Constr. Co., Paragould, Ark., $219,313—grading, shell surfacing 6 mi. Plaquemines Parish, to A. A. Buras, 3128 De Soto St., New Orleans, $68,641 — dredged embankment, with 40 ft. crown width, drainage structures 4.4 mi. Lafourche Parish, to McWilliams Dredging Co., Canal Bank Bldg., New Orleans, $31,046. Bouf River Bridge and 6 other bridges, West Carroll Co., to Litterell Constr. Co., New Orleans, $79,488. Grand total $560,160. Noted Dec. 11 and 18.

Maine — State Hy. Dpt., Augusta, grading, concrete paving 5.59 mi. hy. in Wells, to A. D. Bridges & Son, Hazardville, Conn., $189,668. Noted Jan. 8.

Maryland—State Roads Comn., Baltimore, G. C. Uhl, chn., concrete paving 2.71 mi. Contr. AA-105-72, Anne Arundel Co., to Christhilf & Ensey Co., 1625 Ridgely St., Baltimore, $59,275. Noted Dec. 25.

Md., Baltimore—Grading 37,000 cu.yd. streets listed in Contr. 570, to L. McCourt, 861 Greenmount Ave., $11,235; sheet asphalt paving 7,150 sq.yd. streets listed in Contr. 569, to American Paving Co., Montebello Ave., $31,766.

Mass., Malden—City, H. Estey, engr., widening Exchange St., separate contracts, $25,000.

Mass., Wakefield—Bd. Selectmen, granolithic sidewalks, $30,000; paving Main St., $180,000, separate contracts.

Mass., Winthrop — City, Bd. Selectmen, widening, reconstructing Sturgis St., separate contracts, $25,000.

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Streets and Roads (Continued)

Michigan—R. W. Roberts, resident engr., Saginaw, grading, drainage structures, 12.637 mi. M09-19C-1 and M026-15-1, Gladwin and Bay Counties, to Bridges & Davies, Escanaba, for State Hy. Comn., Lansing, $93,684, incl. cement. Noted 27.

Mississippi—State Hy. Comn., Jackson, clearing, grubbing, grading, culverts, 11.1 mi. roads in Jones Co., to Cooper Bros., Brooksville, $74,246. Noted Jan. 15.

Missouri—State Hy. Dpt., Jefferson City, to Brosnahan Bros., 218 City Bank Bldg., Kansas City, grading 1.034 mi. Ravenwood Rd. W., Nodaway Co., $8,493—to D. Tanner, Charleston, 2.936 mi. Reference 8A, $6,366; 2.541 mi. Reference 8B $4,896, both Mississippi Co.—to J. M. Roark, Anderson, chat surfacing 4.848 mi. Sect. 11, Golden City Rd. N., $39,826; 3.045 mi. Sect. 12, $36,523, both Barton Co., 1.996 mi. Barton Co. Rd. E., Dade Co., $18,572—to Neyer Constr. Co., Billings, 3.579 mi. Sect. 17, Republic Rd. W., $26,210; 3.01 mi. Sect. 18 same road, $19,781, both Greene Co.; graveling 0.832 mi. Green Co. Rd. W., Lawrence Co., $12,887—to W. J. Menefee Constr. Co., Sedalia, 3.182 mi. Route 15 West, Sect. 2A, $4?711; 2.898 mi. Sect. 1A, same road, $4,347; 3.34 mi. Route 15 to Santa Fe Rd., $4,955, all Monroe Co.—to J. A. Kerr, Ozark, 3.712 mi. Hickory Co.-Bolivar Rd., Sect. 4, $8,840; 3.353 mi. Sect. 5, same road, $13,343; 3.452 mi. Sect. 6, same road, $11,744; 4.418 mi. Sect. 7, same road, $17,295, all foregoing Polk Co.—to Samples & Elsea, Kirksville, 0.536 mi. Route 63-Centralia Rd., Sect. 1, Randolph Co., $3,611; 1.212 mi. Sect. 1A, Audrain Co., $7,768—to H. H. Ruddell, Springfield, 2.51 mi. Hartsville Rd. N., Sect. 80, $13,447; 4.78 mi. Sect, 81, $32,992, both Wright Co.—to W. K. Ferman & Co., LaPlata, 4.518 mi. Route 71-Graham Rd., Sect. 1A, $8,195; 4.375 mi. Sect. 2, same road, $18,142, both Nodaway Co.—to F. T. O'Dell, Hannibal, 4.897 mi. Route 19-Stony Hill Rd., Gasconade Co., $16,560; 2.799 mi. Hopewell-Holstein Rd., Warren Co., $20,440; to M. Wunderlich, St. Paul, Minn., 3.892 mi. Maysville-Fairport Rd., DeKalb Co., $13,593—to R. H. Sharp, Reeds Springs, 3.92 mi. Route SB, Sect. 2, Cedar Co., $23,724—to A. E. Keith Constr. Co., 614 City Bank Bldg., Kansas City, 2.282 mi. Taney Co., $13,027—to R. E. Martin, Cotton States Bldg., Nashville, Tenn., 4.96 mi. Doniphan Rd. S., Ripley Co., $73,523—to C. I. Williams, Monett, 0.953 mi. Thru Seneca Rd., Newton Co., $4,573—to A. A. Davis & Co., Inc., Cotton Grain Exch. Bldg., Oklahoma City, Okla., grading, concrete paving 4.67 mi. Union-Leslie Rd., Sect. 326A, $85,796; 4.811 mi. Sect. 326E, same road, $72,028; 4.74 mi. Sect. 326F, same road, $50,878; all foregoing in Franklin Co., to Koss Constr. Co., 205 Old Colony Bldg., Des Moines, Ia., 3.624 mi. Neosho-Granby Rd., Sect. 5, $89,907; 3.938 mi. Sect. 6, same road, $106,677, both Newton Co.—to H. C. Greene Wald, St. Louis, guard fence on Arkansas Line-Anderson Rd., McDonald Co., $10,100. Grand total $903,776. Noted Dec. 11.

Nebraska — Dpt. P. Wks., Lincoln, Class A gravel surfacing 2.5 mi. Project 660-A, Scottsbluff Co., to A. H. Read Co., Cheyenne, Wyo., $1,047 — grading, concrete surfacing 0.9 mi. Project 138-B, Sharpy Co., to Busche-Gavenman Constr. Co., Omaha, $35,738 — 333 ft. rein.-con. bridge, 24 ft. wide, Sarpy Co. to Western Bridge & Constr. Co. 3867 Leavenworth St., Omaha, $29,099. Grand total $65,884. Noted Dec. 18.

New Jersey—State Hy. Comn., Trenton, 8 in. single line rein.-con. paving 4.79 mi. Route 48, Sect. 24, Atlantic Co., to C. D. Prosser, Pitman, $173,890. Noted Jan. 8.

N. J., Bayonne — General Manager Port of New York Authority, 80-90 8th St., New York, constructing Bayonne Approach to Kill van Kull Bridge between Bayonne, N. J. and Port Richmond, N. Y., to C. T. Kavanagh, 7-8 Bway., $248,071. Noted Dec. 18.

New York—A. W. Brandt, comr. Hys., Albany, concrete and cinders 0.66 mi. Nassau Co., to Belmar Contg. Co., Inc., Proctor Bldg., Troy, $134,153 est. $425,879—0.18 mi. Nassau Co., to Municipal Constr. Co., Press Bldg., Binghamton, $68,497 est. $103,729—concrete paving 3.9 mi. Westchester Co., to D'Onfro Bros., Inc., Leominster, Mass., $591,558 est. $760,901. Grand total, $974,208. Soon takes new bids grading, concrete paving 0.18 mi. Westchester Co. Former bids rejected. Noted Dec. 4.

N. Y., Long Island City—G. U. Harvey, pres. Queens Boro, Queens Subway Bldg., to Pomonok Asphalt Co., 1246 Grand St., Brooklyn, asphalt paving 123rd St., $10,931; 45th St. $5,501; 83rd St. $5,557—to Logran Contg. Co., 2301 Beverly Rd., Brooklyn, regulating 149th St. $7,259—to Kennedy-Smith Contg. Co., Bradford Ave., Flushing, asphalt paving 35th Ave. $13,404; 29th St. $12,129—to Slattery Contg. Co., 7202 51st St., grading Park Lane $40,582—to Joy-Simpson, Inc., 16318 Jamaica Ave., Jamaica, regulating 220th St., $76,964. Grand total $172,327. Noted Dec. 11.

O., Cincinnati — City, C. A. Dykstra, city mgr., City Hall, granite curbing, cement sidewalks, vertical fibre brick and granite block paving 1,100 ft. Vine St., 44 to 50 ft., to Aug. J. Henkel Constr. Co., 604 Vine St., $31,592 est. $34,199; granite curbing, cement sidewalks, concrete paving 1,440 ft. Mill St., 30 ft., to W. A. Stewart, c/o City Manager's Office, City Hall, $17,168 est. $25,000. Noted Dec. 18.

O., Cleveland—Cuyahoga Co., excavating, grading, 82,000 cu.yd. Chagrin Falls-Greenville Rd., to B. J. Barr, 11821 Corlett Ave., $18,860. Est. $28,700. Noted Dec. 11.

Pennsylvania — State Hy. Dpt., Harrisburg, grading, concrete surfacing 28,400 sq.yd. Route 678-1, Franklin and Ohio Twps., Allegheny Co., to D. W. Challis & Sons, Sewickley, $178,971; 7.525 sq.yd. Route 246, Ross Twp., Pittsburgh, Allegheny Co., to M. O'Herron Co., South 1st St., $34,599. Noted Dec. 4.

Pa., Brentwood—Bd. Comrs. Allegheny Co. grading, curbing, concrete or brick paving Greenlee Rd. from Kestner Ave. to Clairton Blvd., to D. Carapelucci, 130 Maytide St., Pittsburgh. $35,578.

Texas—G. Gilchrist, state hy. engr., Austin, rock asphalt on caliche base course surfacing 9.177 mi. Kinney Co., to Krisch & Lanham and S. P. Walton, San Antonio, $55,058 est. $100,000—bituminous macadam on caliche base course surfacing 4.542 mi. Coke Co., to R. E. and C. W. Jones, Dallas, $53,408 est. $50,000—double bituminous on crusher-run broken stone base course surface treating and concrete paving 7.851 mi., Hardeman Co., to J. W. Zempter Constr. Co., Amarillo, $87,970, est. $120,000—rein.-con. paving and bit. on caliche surface treating 22.139 mi., Hale Co., to Womack, Henning & Rollins, Sherman, $499,346 est. $440,000—rein.-con. paving 8.448 mi. Anderson Co., and 12.002 mi. Grayson Co., to J. P. Foty, 411 Burt Bldg., Dallas, $166,123, and $227,892 respectively, est. $200,000 and $240,000 respectively—14.532 mi. Houston Co., to R. W. Briggs & Co., Pharr, $298,974 est. $340,000, all foregoing 18 ft. wide—drainage structures $1,497 mi. Comal Co., to Kelley Constr. Co., Box 12, San Antonio, $20,746 est. $32,000—5.142 mi., Travis and Bastrop counties, to Hannah Constr. Co. and F. & D. Hall, Waco, $16,339, est., $25,000—3.1 mi. Brazoria Co., to E. G. Powell, Jacksonville, $27,590 est. 27,000, all foregoing 26 ft. wide. Grand total $1,453,446. Noted Jan. 15.

Texas—G. Gilchrist, state hy. engr., Austin, to J. P. Foty, 411 Burt Bldg., Dallas, grading, drainage structures 12.532 mi., Childress Co., $48,107 est. $30,000; 9,356 mi. Waller Co., $48,921 est. $58,000, both 26 ft. wide; concrete paving, widening shoulders, lengthening culverts, surfacing bridges 11.56 mi., Madison Co., $275,686 est. $242,000—to Thompson & Simpson, San Angelo, bituminous macadam on caliche base course surfacing 12.122 mi. Sterling Co., $135,184 est. $140,000—to McClung Constr. Co., 1309 Fort Worth Natl. Bank Bldg., Fort Worth, double bit. on caliche gravel base course surface treating 9.659 mi., Jones Co. $69,642 est. $120,000; 18.044 mi. Knox Co., $136,567 est. $172,000—to Brown & Root, Box 745, Austin, bituminous surface treatment on gravel base course paving 12.764 mi., Caldwell Co., $75,641 est. $160,000—to Dexter Constr. Co., Hangar 10, Love Field, Dallas, bituminous on waterbound macadam surfacing 11.453 mi. Cottle Co., $131,012 est. $115,000—to J. E. Word & Co., 716 Linz Bldg., Dallas, triple bit. surface treating 17.196 mi. Shackelford Co., $45,580 est. $74,000—to Orr & Rawls, El Paso, triple bituminous on gravel or broken stone base surface treating 14.433 mi., Hudspeth and Culberson Counties, $115,411 est. $200,000—to Dozier Constr. Co., Littlefield Bldg., Austin, rock asphalt surfacing 8.901 mi. Dimmit Co., $31,403 est. $40,000—to Womack, Hennings & Rollins, Sherman, concrete paving 6.06 mi. Jones Co., $111,778 est. $144,000—to Froemming Bros., Inc., rein.-con. paving 4.943 mi. to Foard Co., $99,622 est. $120,000—to W. E. McElwrath, Box 727, Corsicana, 11.861 mi. Hy. 32, F.A.P., Leon Co., $282,832 est. $260,000—to H. B. Zachary, Laredo, grading, drainage, structures, concrete paving 16.404 mi., Nueces Co., $362,597 est. $425,000, all foregoing 18 ft. wide—to James Spencer & Sons Constr. Co., Box 584, Little Rock, Ark., grading, drainage structures 5.071 mi., Ellis Co., $43,432 est. $44,000—to B. F. Brooks Constr. Co., Love Field, Dallas, 8.634 mi. Dalias Co., $18,322 est. $25,000, both 26 ft. wide. Grand total $2,031,737. Rejected bids concrete paving 7.416 mi. Hy. 58, F.A.P. 442-B, Brazoria Co., 18 ft., $180,000. Noted Jan. 15.

Tex., Dallas—For Uvalde Co. rock asphalt paving Lamar St. from Pacific to McKinney Sts., to Southern Paving Co., Santa Fe Bldg., $25,821.

Tex., Victoria—For 2 in. rock asphalt on 7 in. rock base and gravel paving 18 blocks North Main St. and Goodwin Ave., 30 ft., to Brown & Root, Corpus Christi, $110,000.

Tex., Waco—McLennan Co., c/o R. B. Stanford, judge, improving 7 mi. Bewley Lane to Lake Waco, back along old Speegleville Rd., to J. T. Foty, Waco, double squeegee $51,536, 6 in. concrete $114,768, 2 in. cold rock asphalt on gravel $80,248, or 2 in. hot rock asphalt $91,504. Noted Dec. 4.

Utah—State Rd. Comn., Salt Lake City, grading, draining 6.117 mi. Midland Trail, Grand Co. to Reynolds-Ely Constr. Co., Springville, $49,297. Est. $51,046. Noted Jan. 14. Daily. S & T

Utah—State Rd. Comn., Salt Lake City, grading, draining, surfacing, Dixie Hy., Washington Co., to A. C. Thorn and Strong & Grant, Springville, $94,716. Est. $102,994. Noted Jan. 14.

Utah—State Rd. Comn., Salt Lake City, grading, draining, graveling 3.778 mi. Grand Canyon Hy., Kane Co., to B. D. Palfreyman, Springville, $44,754. Est. $54,373. Noted Jan. 9 Daily.

Washington — S. J. Humes, dir. Hys., Olympia, grading, crushed stone surfacing 3.197 mi. State Rd. 3, Denison to Deer Park, Spokane Co., to J. H. Collins & Co., Colville, $45,944. Noted Dec. 11.

West Virginia—State Roads Comn., Charleston, crushed stone surfacing 15 mi. roads in Nichols Co., to Keely Constr. Co., Clarksburg, $54,87? retread surface on stone surfacing 2.9 [illegible] Project 173-D, to Gilbert Constr. Co., G[illegible] Hedrick, $46,263—3.4 mi. Project 173-D, to B. Tyler Co., 1446 Levering St., Louisville, K[illegible] $54,772, both Raleigh Co. Grand total $15[illegible] 912. Noted Jan. 1.

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SUBWAYS AND TUNNELS

PROPOSED WORK

Ill., Springfield — City Council, W. P. Fortune, supt., subway at 10th St. and South Grand Ave. $175,000. W. Seeley, city engr.

BIDS ASKED

Calif., Stockton — E. Graham, clk. San Joaquin Co., bids about Feb. 9, rein.-con. subway under Southern Pacific R.R., on Lower Sacramento Rd., Forrest Lake Dist. for San Joaquin Co. and Southern Pacific R.R. Co., 65 Market St., San Francisco, G. W. Boschke, ch. engr. $26,000.

Massachusetts—Feb. 25, by City of Boston, Transit Dpt., 1 Beacon St., constructing Sect. A, Traffic Tunnel from Boston to East Boston, E. R. Springer, ch. engr.; adv. E. N.-R. Jan. 29.

WASTE DISPOSAL

PROPOSED WORK

Pa., Altoona—City, H. J. Hamor, clk., City Bldg., probably take bids in spring incinerator plant, West Dist. 0.5 mi. outside city limits. $50,000. H. J. Baum, City Bldg., engr.

BIDS ASKED

D. C., Wash. — Mar. 4, by District Comrs., District Bldg., constructing either or both of 2 municipal refuse incinerators, burning 170 tons and 425 tons daily capacity respectively; adv. E. N.-R. Jan. 29.

Ont., Ottawa — Secretary Bd. Control bids about Mar. 1, 2 units, incinerator. $100,000. A. F. Macallum, City Hall, engr. Noted Dec. 4.

WATERWORKS

PROPOSED WORK

Calif., Sacramento—Plans new sedimentation basin in connection with filtration system. $450,000. F. J. Klaus, city engr.

Ind., Plainfield—Soon takes bids waterworks improvements, incl. 150,000 gal. tank, 4,500 ft. c.i. pipe, 15 fire hydrants, gate valves. G. Longmire, town clk.-treas.

N. H., Nashua—City increasing high service water system, erecting new basin on Oak Hill to connect with present basin to increase capacity, from 5 to 20 m.g. $350,000.

Tex., Wharton — Soon takes bids drilling water well, furnishing, erecting one 250,000 gal. or larger elevated tank. $30,000. A. H. Armstrong, mayor. J. C. McVea, 426 Esperson Bldg., Houston, engr.

Utah, Price—City 3 m.g. rein.con. reservoir, incl. 15,000 cu.yd. excav., 1,565 cu.yd. concrete $25,000. C. Nyman, Helper, engr.

BIDS ASKED

Ariz., Miami—See "Contracts Awarded."

Calif., Lompoc — Feb. 3, by City Council, furnishing 2,800 ft. 8.625 in. O.D. bu. 8.249 in. I.D. pipe weight, 16.94 lb. per ft., 100 ft. 8 in. O.D. x 7.628 in. I.D. pipe, 15.522 lb. per ft., 600 ft. 7 in. O.D. x 6.652 I.D. pipe, 12.685 lb. per foot, all lapwelded black steel pipe, plain end beveled 45 degrees for welding, asphaltum dipped, f.o.b. Lompoc.

Calif., Santa Ana—See "Grade Crossings."

Ind., Evansville—See "Contracts Awarded."

Kan., Neodesha—Feb. 7, by S. G. Hamilton, city clk., altering settling basin, clear well, converting existing filter boxes into addition clear well capacity, also new filter and chemical house, 40,000 gal. steel wash water tank, filters to consist of two 1 m.g. per day units, Black & Veatch, 701 Mutual Bldg., Kansas City, Mo., engrs. Noted Dec. 4 under "Contracts Awarded."

Ky., Walton—Feb. 3, by City Council, 9 m.g. available capacity earth dam, 30 ft. high, 2 mi. 2- to 6-in. pipe lines, 150 g.p.m. centrifugal pump, 75,000-100,000 gal. elevated tank, settling basin. $50,000. C. N. Harrub Eng. Co., 4th and 1st Natl. Bank Bldg., Nashville, Tenn., engrs.

Md., Baltimore—Feb. 18, by Bureau Water Supply, constructing, installing 84 in. Montebello-Druid Conduit. E. G. Rost, water engr.; adv. E. N.-R. Jan. 29.

Mo., St. Louis—Feb. 2, by Water Dpt., L. Day, comr., City Hall, c.i. pipe, steel pipe, hub valves, for Water Dpt. N. L. Meston, supply comr.

N. Y., Long Island City—Feb. 3, by J. J. Dietz, comr. Water Supply, Gas & Electricity, Municipal Bldg., mains in 41st Dr., 12th, 64th and 69th Rds., 82nd and 84th Pls., Eliot, Metropolitan, Roosevelt, Westmoreland, 14th and 29th Aves., 66th, 84th, Concord, 164th, 202nd, 234th and 235th Sts.

Tex., Dallas — Preston Road Fresh Water Dist., c/o Bd. Supervisors, bids about Feb. 1 waterworks, incl. c.i. mains, laterals, elevated tank and tower to furnish water for 5,500 acre

Waterworks (Continued)

district. $175,000. Koch & Fowler, 801 Central Bank Bldg., engrs. Noted Dec. 25.

Tex., Yoakum—Feb. 6, by City, c/o E. S. Winfrey, mayor, complete waterworks, incl. 158,374 ft. 2- to 10-in. c.i. pipe, 2 ten in., 30 eight in ..127 six in. 140 two in. gate valves, 188 fire hydrants, 1 concrete reservoir, one 300,000 gal. elevated tank, 1 pumping station, 2 deep well pumps, 2 booster pumps, 1,000 meters and boxes, 30,000 lin.ft. copper services, 1 trapping machine, etc. Montgomery & Ward, Harvey-Snider Bldg., Wichita Falls, consult. engrs. Noted Jan. 22.

Ont., Hamilton — Feb. 19, by City Clerk, twelve 36 x 42 in. and twelve 24 x 24 in. hydraulically operated gates, four 48 x 72 in. and three 72 x 72 in. hand operated gates; Mar. 5, 4 low lift waterworks pumps and 2 wash water pumps.

CONTRACTS AWARDED

Ariz., Miami—Arizona Edison Co., R. Gilbert, mgr., 1 m.g. reservoir, 6 and 8 in. c.i. pipe; five 8 in. hydrants, 200 new street lights, day labor. $50,000. B. Goodsell, Miami, const. engr. Noted Oct. 2.

Calif., Glendale—City Council, 2 rectangular shaped reservoirs, 22 ft. deep, 238,322 sq.ft. capacity, to Mittry Bros. Constr. Co., Detwiler Bldg., Los Angeles, $499,000. Noted Dec. 11.

Calif., Hawthorne—City Council, to Pacific States Cast Iron Pipe Co., 417 South Hill St., Los Angeles, 5,200 ft. 2 in. c.i. pipe at $0.19 per ft., 2,500 ft. 4 in. $0.395, 2,500 ft. 6 in. $0.59.

Calif., Oakland — Bd. Directors East Bay Municipal Utility Dist., 1,000 ft. 20 in. and 9,000 ft. 16 in. Class B c.i. pipe, 40,000 ft. 6 in. Class 150 c.i. pipe, to U. S. Cast Iron Pipe & Fdry. Co., Monadnock Bldg., San Francisco, $47,970; furnishing gate valves, to Rensselaer Valve Co., 55 New Montgomery St., San Francisco, $8,350.

Conn., New London — Extending watermain from Jefferson Ave. to Broad St. $21,500. City builds (unemployed labor).

Ind., Evansville—Waterworks improvements, day labor, $100,000. Total est. $250.0000. Black & Veatch, 700 Mutual Bld., Kansas City, Mo., engrs.

Mich., Detroit—Fire Dpt., furnishing 300 six in. Detroit Fire Dpt. double standard fire hydrants, equipped with Blaita valves, to Michigan Valve & Fdry. Co., Clayton and Parkinson Sts., at $53.45 each, total $16,035.

N. Y., New York—J. J. Dietz, comr. Water Supply, Gas & Electricity, Municipal Bldg., mains in Katonah Ave., to Melrose Contg. Co., 316 Crimmins Ave., $2,820. Noted Jan. 1.

N. D., Grand Forks—Bd. City Comrs., water intake, pump house, in East Grand Forks, laying pipe line from pump house to bridge over Red River, then across bridge to here; also second pipe in riverbed, to Starbuck Constr. Co., Starbuck, Minn., $35,828. Noted Jan. 1.

Okla., Lawton—T. Sanders, city clk., 1 m.g. standpipe, and 300,000 gal. elevated tank on tower, to Pittsburgh-Des Moines Co., Petroleum Bldg., Dallas, Tex., $37,500, est. $42,000; valves, hydrants, distribution system, to Darling Valve & Hydrant Co. Williamsport Pa., $12,012, est. $12,500; supply line from Lake to city and to Ft. Hill, also extension to distribution system, to Sherman Machine & Iron Wks., 18 East Main St., Oklahoma City, $209,746 and $161,284 respectively, ests. $225,000 and $175,000 respectively. Grand total, $420,542. Noted Jan. 8.

UNCLASSIFIED

PROPOSED WORK

Okla., Minco—GAS SYSTEM—Franchise election Feb. 9, natural gas system to Western Service Corp., Oklahoma City. $40,000. E. R. Ernsberger, Oklahoma City, engr.

Okla., Mulhall—GAS SYSTEM—City, franchise election Feb. 4, natural gas system to Mulhall Gas Co. $25,000. Private plans. J. J. Estus, city clk.

Okla., Pocasett—GAS SYSTEM—Franchise election Feb. 9, natural gas system to Western Service Corp., Oklahoma City. $25,000. E. R. Ernsberger, Oklahoma City, engr.

Okla., Tuttle—GAS SYSTEM—Franchise election Feb. 9, natural gas system to Western Service Corp., Oklahoma City. $30,000. E. R. Ernsberger, Oklahoma City, engr.

Tennessee — GAS PIPE LINE — Memphis Natural Gas Co., 42 Cedar St., New York, H. G. Scott, pres., plans 12 in. high pressure natural gas line from Memphis to Jackson serving towns in West Tennessee, franchises granted to Covington, Ripley, Brownsville and Jackson. $2,500,000. Owner takes bids in May on pipe, etc.

Tenn., Memphis—OIL TANKS—Gulf Refining Co., Frick Bldg., Pittsburgh, Pa., soon lets contract four 1,037,000 gal. steel storage tanks, trackage, office, on 200 x 2,000 ft. site. $1,000,000. B. F. Burke, 231 Atherton Dr., New Orleans, engr.

BIDS ASKED

Mass., Foxboro—FARM BUILDINGS—Jan. 30, by Commonwealth of Massachusetts, Dpt. Mental Diseases, State House, Boston, group brick, tile farm buildings, at State Hospital. $150,000. W. E. Boyd, State House, Boston, engr. Noted Jan. 1.

Mass., Northampton — RECREATION PAVILION—See "Contracts Awarded."

N. Y., New York—PIPE TUNNELS, etc.— Feb. 5, by Bd. Higher Education, at office Secretary Hunter College, Park Ave. and 68th St., general contract pipe tunnels, passages for Hunter College, Bedford Park Blvd., Strong St., Goulden, Jerome and Navy Aves., Thompson, Holmes & Converse, and C. B. Meyers, 101 Park Ave., archts. Noted Jan. 22.

Ont., Ottawa—ASPHALT PLANT—Secretary Bd. Control bids about Mar. 1, new asphalt plant. $40,000. A. F. Macallum, City Hall, engr.

CONTRACTS AWARDED

Mass., Northampton — RECREATION PAVILION—Commonwealth of Massachusetts, Dpt. Mental Diseases, State House, Boston, recreation pavilion at State Hospital, day labor. $25,000. W. E. Boyd, c/o owner, engr.

N. Y., Pine Aire Station—REFRIGERATION, etc.—Commissioner Dpt. Mental Hygiene, State Office Bldg., Albany, refrigeration for Pilgrim State Hospital, to Mayer Refrigerating Co., 20 Wadsworth St., Wallington, N. J., $9,800; heating, to Astoria Heating Co., 4151 70th St., Woodside, $1,000; kitchen equipment building 3, to S. Blickman, Inc., 536 Gregory Ave., Weehawken, N. J., $29,290. Grand total, $40,090. Noted Nov. 27.

N. Y., Jamaica—LAUNDRY EQUIPMENT—Dpt. Hospitals, J. G. W. Greeff, comr., Municipal Bldg., New York, laundry equipment for Queens General Hospital, to Troy Laundry Mchy. Co., 235 East 45th St., New York, $79,100. Noted Jan. 8.

Industrial Buildings

FACTORIES AND MILLS

PROPOSED WORK

Tex., Dallas—FREIGHT TERMINAL—Burlington & Rock Island R.R., W. S. Broome, Houston, engr., freight terminal, Young St. $500,000.

Wash., Seattle—ASSEMBLY PLANT—Albert Kahn, Inc., archts. and engrs., 1000 Marquette Bldg., Detroit, Mich., revised bids 1 and 2 story, 320 x 750 ft., brick, steel, rein.-con. assembly building incl. oil house, with 40 x 500 ft. concrete dock, East Marginal Way, for Ford Motor Co., 3674 Schaefer Rd., Dearborn, Mich. $1,500,000. Noted Dec. 4.

BIDS ASKED

Calif., San Leandro—FACTORY—See "Contracts Awarded."

Conn., Higganum — BOTTLING PLANT — Undina Beverage Co., B. A. Benson, vice pres., taking bids 2 story, 75 x 125 ft., brick, timber, $50,000. Private plans. Noted Jan. 22.

Ga., Austell—THREAD MILL—Feb. 10 (selected list of bidders), by J. E. Sirrine & Co., archts. and engrs., Greenville, S. C., brick, steel, for Clark Thread Co., W. H. Lostus, 260 Ogden St., Newark, N. J. $2,000,000. Noted Dec. 18.

Ind., Dale—PLANT—Kraft Cheese Co. taking bids 1 story, steel, rein.-con., brick. $41,000. Private plans.

Ind., Winchester—PLANT—See "Contracts Awarded."

Mo., St. Louis — ELECTRIC MANUFACTURING PLANT — See "Contracts Awarded."

N. J., Jersey City — MILK DISTRIBUTION PLANT—Jan. 31, by Sheffield Farms, 524 West 57th St., general contract milk distribution plant. $40,000. Noted Jan. 15.

N. J., Newark—FACTORY—Weldon Roberts Rubber Co., 180 Oliver St., bids about Feb. 15, general contract altering 2 story, basement, brick, steel, plain found., 361-65 6th Ave. $40,000. M. N. Shoemaker, 10 Bleecker St., archt Noted Jan. 22.

N. J., Orange—FACTORY—T. Sangiaconi, Collins St., taking bids 3 story, basement, 35x55 ft., brick, steel, plain found., 160-64 South St. $40,-000. A. P. Nucciarone, 206 Central Ave., archt. Noted Jan. 15.

N. J., Wallington—BAKERY—J. T. Camlet, archt., 26 Piaget Ave., Clifton, taking bids 2 story, basement, brick, steel bakery, store, garage, Wallington Ave. and Mercer St., for J. Borbuta, 103 Halstead St. Est. $40,000. Noted Jan. 29.

O., Canton — FACTORY — See "Contracts Awarded."

CONTRACTS AWARDED

Calif., Pomona—CREAMERY and DAIRY—City Dairy Co., part 1 and 2 story, stone, tile, 6th and Garey Sts., to H. Poulsen, 645 North Towne Ave., $45,000.

Calif., San Leandro — FACTORY — Wurm Woven Hosiery Mills, 414 12th St., Oakland, 1 story, 60 x 108 ft., brick, steel, Foothill Blvd., separate contracts. Former contract rescinded. Noted Jan. 8.

Calif., South Gate (br. Huntington Park)—QUARTZ PLANT—Philadelphia Quartz Co., 6th and Grayson Sts., Berkeley, three 1 story, 70x80 ft., 40x80 ft. and 50x60 ft. corrugated iron or asbestos siding, steel. $50,000. Owner builds. W. E. Lyons, c/o owner, constr. engr.

Conn., Willimantic—SILK THROWING MILL —Willimantic Silk Co., Inc., 1 story, 53 x 222 ft., brick, to O. L. Willard, 70 Valley St. Est. $52,000.

Ind., South Bend—PLANT—H. G. Christman, brick, steel, Wayne and St. Francis Sts. $40,-000. Owner builds. Private plans.

Ind., Winchester — PLANT — United Pub. Serv. Co., improving plant, own forces. $50,000. Private plans.

Mo., St. Louis—ELECTRIC MANUFACTURING PLANT—Chandeysson Electric Co., 4092 Bingham Ave., 1 story, 82x200 ft., brick, concrete steel addition, separate contracts. $40,000. Clymonts & Heimicke, 721 Wainwright Bldg., archts.

Mo., St. Louis—ICE PLANT—Crystal Ice Co., Inc., L. Margolin, secy.-treas., general contract 1 and 2 story, 60 x 120 ft., rein.-con., brick, tile, on 173 x 200 x 235 ft. site, Cass, Easton and Spring Aves., to A. H. Stiel, 813½ Chestnut St., $100,000 incl. equipment.

N. J., Newark—BAKERY—H. Holder, archt., 242 Franklin Ave., Brooklyn, N. Y., general contract 1 story, basement, 50 x 100 ft., rein.-con., brick, to Robert Allen, Inc., 319 Mount Pleasant Ave., for Brownel Realty Co., c/o Dugan Bros., lessee, 161 Arlington Ave. Est. $40,000. Noted Nov. 13.

O., Canton — FACTORY — Bosshardt Steel Corp., Allen Ave. S. E., reconstructing steel plant, recently acquired from Old Canton Sheet Steel Co., incl. constructing 2 annealing furnaces, several plant units, 2 new Bosshardt furnaces, to A. F. Wendling Contg. Co., Massillon, $100,000.

O., Canton — FACTORY — Mirific Products Co., Canton, and Granite City, Ill., 60 x 180 ft. factory, 20th St., N. E., separate contracts. $40,000. Noted Dec. 4.

GARAGES

BIDS ASKED

Calif., Santa Rosa—Pacific Gas & Electric Co., 245 Market St., San Francisco, taking bids service buildings, incl. garage, transformer house, shops, meter house, pole yard. $60,000.

N. Y., New York — Spear & Co., 575 6th Ave., bids about Jan. 24, general contract 10 story, 100 x 145 ft. warehouse, 524 West 23rd St. $450,000. L. Davidson, 104 West 42nd St., archt. Noted Oct. 9 under "Warehouses."

CONTRACTS AWARDED

Ind., Ft. Wayne—Fox Realty Co., Harrison and Washington Sts., 3 story, basement, rein.-con., brick garage, Harrison and Washington Sts., to Moynahan Constr. Co., 710 Union Title Bldg., Indianapolis, $200,000.

Ind., Richmond — Thompson Bros., general contract 40 x 90 ft., rein.-con., brick, stone, steel, super service station, South 5th St., to E. Anderson, Centerville. Est. $40,000.

Pa., Jenkintown—See "Buildings-Residential."

POWER PLANTS

PROPOSED WORK

Calif., Long Beach — Southern California Edison Co., 306 West 3rd St., Los Angeles, additional 135,000 hp. steam plant unit, $7,500,000. Stone & Webster (H. F. Hendrickson, 1643½ North Kenmore St., Los Angeles, mgr.), 510 Laughlin Bldg., Los Angeles, engrs.

Idaho, Idaho Falls—City, 19,000 hp. municipal hydro-electric plant, Snake River. $2,000,-000. C. R. Black, city engr.

Mass., Springfield—United Electric Light Co., 73 State St., soon takes bids 66,000-115,000 volt electric power plant, East Springfield. $1,-250,000. Private plans.

Tex., Eagle Pass — Central Power & Light Co., Frost Bldg., San Antonio, c/o S. M. Udden, hydro-electric plant having 10,000 hp. capacity with 82 ft. head, also installation of 2 or 3 generating units on irrigation canal adjacent to Rio Grande River, near here. $1,400,000. Private plans.

BIDS ASKED

La., Opelousas — Feb. 10, by City Council, furnishing, installing one 950 to 100 hp. vertical, multi cylinder, 2 or 4 stroke cycle, Diesel engine, motor operated governor, 650 kw. alternator and exciter, switchboard.

CONTRACTS AWARDED

Calif., San Francisco — University of California, general contract 1 story, steel, concrete power plant, 3rd and Parnassus Aves., to J. S. Hannah, 208 Market St., $23,753; mechanical equipment, to C. C. Moore & Co., Sheldon Bldg., San Francisco, $88,805.

Utah, Mount Pleasant—City, 4,000 ft. 16 in. welded steel pipe for municipal hydro-electric plant, to Burnham Mfg. Co., Woods Cross, $6,000; hydro-electric machinery, to General Electric Co., Continental Bldg., Salt Lake City, $11,620.

SHOPS AND FOUNDRIES

CONTRACTS AWARDED

Calif., San Mateo — SHOPS —Pacific Gas & Electric Co., 245 Market St., San Francisco, concrete shops, service station, to H. H. Larsen, 64 South Park, San Francisco, $60,000.

Mich., Detroit — FOUNDRY — Detroit Gray Iron Fdry., Meldrum and Wight Sts., 2 story, 75 x 160 ft., brick, steel, concrete foundry building, pits, plain found., to C. O. Barton, 1900 East Jefferson Ave. $100,000. Noted Aug. 21.

Pa., Phila. — MANUFACTURING PLANT— Philadelphia Storage & Battery Co., E. Davis, pres., Ontario and C Sts., 5 story, basement, 94x

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Shops and Foundries (Continued)

250 ft., rein.-con., steel, brick, plain found., C and Tioga Sts., to W. Steele & Sons Co., 124 North 15th St.

WAREHOUSES

PROPOSED WORK

Mass., Boston—Standard Oil Co. of New York, Park Sq. Bldg., oil storage plant in East Boston Sect. $40,000. Private Plans.

N. J. Weehawken—Bonanno Weehawken Warehouse Co. 1827 Bergen Turnpike, North Bergen, brick, steel, warehouse, plain found., 100x300 ft. site. Park Ave. and 19th St. $500,000. **Maturity probably soon.**

Pa., Corry—Corry-Jamestown Mfg. Co., c/o A. Hillstrom, mgr., Center St., **1 story, brick,** steel warehouse. Private plans.

CONTRACTS AWARDED

Pa., Pittsburgh — H. J. Lohrey Co. (meat packers), 2232 East St., W. G. Lohrey, in charge, 4 story, 50 x 50 ft., brick, concrete refrigeration warehouse, 2234 East 26th St., to H. A. Bloedel, 3720 Ruggles St. Noted Jan. 22.

Que., Montreal—C. B. Brown, ch. engr. (oper.) Canadian Natl. Rys., Montreal, Insurance Exch. Bldg., St. James St., 3 story, 76 x 638 ft. fruit warehouse, incl. 2 sets, tracks having total capacity of 50 cars, continuous platform reaching from cars to warehouse, to Atlas Constr. Co. Ltd., 37 Belmont St. Noted Jan. 8.

Commercial Buildings

BANKS

PROPOSED WORK

Mass., Somerville (br. Boston)—Winter Hill Co-operative Bank, G. Lovejoy, pres., bids latter part month, 1 and 3 story, basement, irregular sized, brick, rein.-con., stone, steel ,plain found., Summer and Cutter Sts. $250,000. Desmond & Lord, 1 Beacon St., Boston, archts. Noted Jan. 8.

Mass., Weymouth—Weymouth Trust Co., 92 Pleasant St., soon takes bids 1 story, basement, brick, concrete, stone, steel, concrete found., Washington St. corner Prospect St. $150,000. Harper & West, 92 State St., Boston, archt. Noted Dec. 25.

BIDS ASKED

N. J., Red Bank—Warren & Wetmore, archts., 16 East 47th St., New York, bids about Apr. 1, general contract 6 story, basement, brick, steel, rein.-con. office, bank, store, Broad and Monmouth Sts., for Merchants Trust Co., K. McQueen, pres., 30 Broad St. $500,000. Noted July 3.

CONTRACTS AWARDED

Calif., Monterey—Monterey Co. Trust & Savings Bank, 1 story, mezzanine, steel, rein.-con. bank, office, to H. Finlayson, c/o H. H. Winner Co., 580 Market St., San Francisco, $200,000.

N. Y., Brooklyn — Dime Savings Bank of Brooklyn, DeKalb Ave., bank addition, DeKalb Ave. and Fleet St., to W. Kennedy Constr. Co., 215 Montague St. Est. $2,500,000.

CHURCHES

PROPOSED WORK

Conn., West Hartford (br. Hartford)—Beth Israel Congregation, 21 Charter Oak Ave., Hartford, revised plans by C. R. Greco, 11 Beacon St., Boston, Mass., temple and community building, Farmington Ave. To exceed $150,000. J. P. Dwyer, Jr., 80 Boylston St., Boston, Mass., engr.

Mass., Attleboro—St. John's Roman Catholic Parish, J. M. Quinn, pastor, soon takes bids 1 story, basement, irregular sized, brick, stone, plain found., North Main St. $200,000. Maginnis & Walsh, Statler Bldg., Boston, archts. Noted Sept. 18.

R. I., Cranston (mail Providence) — Santa Maria Delta Civita Roman Catholic Church, C. Schettini, pastor, 1521 Cranston St., Providence, revised plans by E. Migliori, 524 Westminster St., Providence, 1 story, basement, 60 x 120 ft., brick, stone, concrete, plain found., Knightsville Sect. $150,000.

BIDS ASKED

N. J., East Orange—Meyers, Murray & Philip, archts., 2 West 47th St., New York, bids about Mar. 1, 2 story, brick, steel, for Central Brick Presbyterian Church, H. E. Nicley, pastor, 113 Woodlawn Ave. $150,000. Noted Dec. 18.

N. J., Red Bank—First Methodist Church of Red Bank, F. A. DeMaris, rector, bids about Apr. 1, general contract 3 story, basement, brick, steel, LeRoy Pl. and Broad St. N. Hulme, 1524 Chestnut St., Phila., Pa., archt. H. E. Traile, Pinehurst Ave. and 183rd St., New York, consult archt. Noted Nov. 27.

O., Youngstown—Feb. 12, by Martin Luther Congregation, F. J. Schellhase, pastor, 109 East Wood St., 1 story, steel, stone, concrete church, Hudson St. $200,000. W. E. Foster, 1900 Euclid Bldg., Cleveland, archt. H. F. Kling & Son, Phelps St., assoc. archt. Noted Oct. 30.

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CLUBS

BIDS ASKED

Ill., Kewanee—Feb. 5, by Y. M. C. A., W. E. Lauterbach, secy., 1025 South Main St., 2 story, basement, 114x120 ft., rein.-con., brick, plain found., 1st St. $260,000. C. N. Walcott, 435 North Michigan Ave., Chicago, archt. J. W. Ogg, Y. M. C. A. Bldg., Chicago, assoc. archt.

N. J., Freehold—E. H. Schmeider, archt., 3rd Ave., Spring Lake, bids about Apr. 1, general contract 2 story, basement, brick, steel club house, for Knights of Columbus. $150,000. Noted Dec. 11.

CONTRACTS AWARDED

N. Y., New York—Seaman's Christian Assn. and Y. M. C. A., 420 Lexington Ave.,general contract seaman's branch Y. M. C. A., to J. Lowry, 270 Madison Ave. Est. $700,000. Noted Jan. 15.

N. C., Charlotte—Charlotte Country Club, c/o H. M. Wade, Charlotte, general contract country clubhouse, to Southeastern Constr. Co., Charlotte, $150,000. Noted Jan. 1.

O., Youngstown—Y. M. C. A., L. T. Skeggs, secy., 3 story, 88x141 ft., brick, steel, concrete building, Wick Ave., to Garrity & Parish, 144 West Wood St. Est. $200,000. Noted Nov. 13.

HOSPITALS

PROPOSED WORK

N. J., Newark—St. Barnabas Hospital, J. G. Martin, supt., 685 High St., 5 story, basement, brick, steel hospital, nurses' home, power house, High St. $1,500,000. Project in abeyance. Noted Jan. 15.

BIDS ASKED

Mass., Waltham—Feb. 3, by Middlesex Co. Court House, East Cambridge, 2 dormitories, recreation building, nurses home, 2 and 3 story, basement, brick, and sewage disposal system at Middlesex Co. Tuberculosis Hospital. To exceed $150,000. J. H. Ritchie & Associates, 250 Stuart St., Boston, archts.

N. J., New Brunswick — Maginnis & Walsh, archts., 100 Boylston St., Boston, Mass., bids about Mar. 15, completing 5 story main hospital and constructing 2 new 5 story, basement, 45x110 ft. brick, steel wings, Easton Ave., for St. Peter's General Hospital, Easton Ave. $150,000 or more. Noted Jan. 15.

N. Y., New York—Gehron & Ross, archts., 101 Park Ave., taking bids general contract altering nurses' training school, 100th St. and 5th Ave., for Mount Sinai Hospital, 1 East 100th St. $175,000. Noted Dec. 11.

N. Y., New York—Feb. 16 ,by Dpt. Hospitals, J. G. W. Greeff, comr., Municipal Bldg., general contract altering and constructing main building addition, at Lincoln Hospital, Concord Ave. and East 141st St. C. B. Meyers, 31 Union Sq., archt. Noted Jan. 8.

O., Cincinnati—Feb. 5, by Comrs. Hamilton Co., Court House, 6 story, basement, 54 x 151 ft., brick hospital, plain found., Guerley Rd. $663,000. S. Hannaford & Son, Dixie Terminal, archts. Noted Oct. 30.

CONTRACTS AWARDED

Ky., Louisville — D. X. Murphy & Bros., archts., Louisville Trust Bldg., 5 story, basement, 180 x 330 ft., brick, stone addition, to J. F. Russell & Co., Brook and Bloom Sts., for J. N. Norton Memorial Infirmary, 3rd and Oak Sts. Est. $500,000.

N. Y., White Plains—St. Agnes Hospital, North St., general contract hospital, to F. A. O'Hare, 270 Madison Ave., New York. Est. $750,000. Contractor taking bids on steel and separate contracts. Noted Jan. 15.

LOFTS

PROPOSED WORK

N. Y., New York—Church Wardens Vestrymen of Trinity Church, G. F. Crane, controller, 52 Wall St., sketches by V. Mayper, 110 West 40th St., 15 story loft, store, storage, 167 Chambers St. To exceed $600,000.

OFFICES

PROPOSED WORK

Mich., Detroit — F. P. Miller, Cadillac Sq. Bldg., plans by H. Reid, c/o owner, 14 story, basement, 53 x 120 ft., brick, steel, concrete, steel, plain found., Lafayette St. and Cass Ave. $1,000,000.

N. Y., New York—O. R. Manowaski c/o Hotel Roosevelt, 45th St. and Madison Ave., sketches by Jardine, Murdock & Wright, 347 Madison Ave., 47 story office, 441 5th Ave. $1,500,000.

N. Y., New York—United States Trust Co., 45 Wall St., plans by Shreve, Lamb & Harmon, 11 East 44th St., 25 story, office addition to Bankers Trust Building, Wall and Nassau Sts. $5,500,000.

N. Y., New York — C. Wagner, 697 East 132nd St., sketches by N. Rotholz, 155 East 42nd St., 10 story, 126 x 222 ft. office, stores, Fordham Rd. and Grand Concourse. $1,200,000.

BIDS ASKED

D. C., Wash. — Feb. 12, by C. N. and N. Friz, archts., Lexington Bldg., Baltimore, Md., 6 story, basement, 71 x 336 ft., rein.-con., brick, steel, terra cotta, limestone office building and service station, B, 2nd and 3rd Sts. N. W., for Standard Oil Co. of New Jersey, 241 Pennsylvania Ave. N. W. $1,000,000. Noted Mar. 13.

Mass., Cambridge—See "Contracts Awarded."

N. J., Irvington (br. Newark)—TOWN HALL—Bd. Town Council, Town Hall, will not build 3 story, basement, brick, steel, plain found., Lincoln and Park Pls., Nye and Springfield Aves. $600,000. G. C. Higby Co., 307 Market St., Newark, archts. Noted Dec. 18.

CONTRACTS AWARDED

Calif., Los Angeles — T. D. Barnett, c/o Morgan, Wells & Clements, Van Nuys Bldg., 12 story, basement, rein.-con., steel office, stores, to Lindgren & Swinerton, Inc., 523 West 6th St., $750,000. Noted Jan. 29.

Conn., Stamford — Vuono Constr. Co., 1 Atlantic St., 6 story, 50 x 70 ft., brick, steel, limestone office and store building, Bedford and Broad Sts. $150,000. Owner builds. Butler & Provost, 35 Atlantic St., archts.

Ill., Peoria—Central Natl. Bank, Main and Adams Sts., 7 story rein.-con., brick, steel top addition, also altering main building, Main St., to W. Allen Son & Co., Jefferson Bldg., and F. Harbers & Sons, Central Bank Bldg. Est. $250,000.

PUBLIC

PROPOSED WORK

N. J., Bradley Beach—MUNICIPAL—Bd. City Council, 701 Main St., bids about April on revised plans 2 story, basement, brick, steel addition, Main St. and La Reine Ave. $150,000. K. M. Towner, Kinmouth Bldg., Asbury Park, archt. Noted Jan. 29, 1930.

BIDS ASKED

Mass., Westboro—DORMITORY and KITCHEN—Jan. 30, by Commonwealth of Massachusetts, Dpt. Mental Diseases, State House, Boston, 3 and 1 story, basement, 2 wings, brick, steel, plain found., at State Hospital. $150,000. W. E. Boyd, State House, Boston, engr. Noted Jan. 22.

N. J., Asbury Park—BATH HOUSES, etc.—Bd. City Comrs., City Hall, bids about Apr. 1, 2 story, basement, brick, steel stores, bath houses, near Convention Hall between 4th and 5th Aves. $250,000. Warren & Wetmore, 16 East 47th St., New York, archts. Noted Dec. 11.

N. J., Glen Ridge—MUNICIPAL—Feb. 2, by Bd. Boro Council, Boro Hall, general contract 2 story, basement, brick, steel, rein.-con. plain found., Ridgefield and Bloomfield Aves. $175,000. W. D. Bartlett, Lefcourt Bldg., Newark, archt. Noted Jan. 8.

N. J., Morristown—JAIL and OFFICE—Bd. Freeholders Morris Co., Court House, bids about Apr. 1, general contract 4 story, basement, brick, steel, Court St. $150,000 or more. Palmer & Plousky, 55 William St., New York, archts. Noted Jan. 8.

N. Y., Buffalo—FIRE STATION—Feb. 5, by G. Fisk, comr. P. Wks., fire department building, Court and Staats Sts. $325,000. H. Beck, 374 Delaware Ave., archt.

CONTRACTS AWARDED

N. Y., Brooklyn—COURT HOUSE—H. Hesterberg, pres. Brooklyn Boro, Boro Hall, general contract magistrates and municipal court house, to E. Waters & Co., Inc., 1482 Bway., New York, $438,843; plumbing, to G. D. Casper, 204 Jackson Ave., Long Island City, $13,980; heating, ventilating, oil burning equipment, to Raisler Heating Co., 129 Amsterdam Ave., New York, $32,900. Grand total $485,723. Noted Jan. 8.

Tex., Cotulla—COURT HOUSE and JAIL—La Salle Co., c/o G. A. Welhausen, judge, general contract 3 story, basement, brick, tile, rein.-con., to Southwest Constr. Co., Del Rio, $75,702. Noted Jan. 1.

RESIDENTIAL

BIDS ASKED

Calif., Los Angeles—D. Sward, archt., 508 Delta Bldg., taking sub-bids rein.-con., steel apartment, garage Detroit St. between Coth St. and Wilshire Blvd., for E. McIntyre. $175,000.

Calif., Los Angeles—See "Contracts Awarded."

Calif., San Francisco—J. L. Stewart, archt., 206 Sansome St., taking bids 7 story, basement, Class A, steel, concrete, Sutter St. near Franklin St., for Mutual Owners Assn., c/o architects. $175,000.

Mo., St. Louis—See "Contracts Awarded."

N. J., Asbury Park—C. E. Van Wickle, 501 Grand Ave., taking bids general contract 6 story, basement, brick, steel, Grand and 4th Aves. $400,000. Tillion & Tillion, 48 West 48th St., New York, archts. Former bids rejected. Noted Jan. 10.

N. J., Atlantic City — See "Contracts Awarded."

N. Y., Brooklyn—See "Contracts Awarded."

N. Y., Kew Gardens—See "Contracts Awarded."

N. Y., Long Island City—See "Contracts Awarded."

N. Y., New York—See "Contracts Awarded."

N. Y., Ridgewood—See "Contracts Awarded."

N. Y., Woodside—See "Contracts Awarded."

Pa., Pittsburgh—M. Nirdlinger, archt., 905 Empire Bldg., taking bids 3 story basement, 50 x180 ft., brick, stone, tile, steel, rein.-con. found., 151 North Craig St., for J. and E. F. Hays, 151 North Craig St. $150,000. Noted Jan. 8.

Pa., Upper Darby — Heacock & Hokenson, archts., 1211 Chestnut St., Phila., soon lets contracts 10 story, basement, 99 x 125 ft., rein.-con., brick, steel, plain found., 69th and Walnut Sts., for Fair Orchard Corp., c/o architects. Noted Jan. 8 under Philadelphia.

Residential (Continued)

CONTRACTS AWARDED

Calif., Los Angeles—E. and E. McIntyre, c/o F. Sward, Delta Bldg., 7 story, basement, 60 x 125 ft., rein.-con., Detroit St., separate contracts. $175,000.

Mo., St. Louis—Paramount Constr. Co., 1101 International Bldg., two 3 story, basement, 55 x 170 ft., rein.-con., brick, stone, terra cotta buildings, 4600 Block Lindell Blvd., separate contracts. O. J. Popp, 1528 Arcade Bldg., archt.

N. J., Atlantic City—A. Clark, 1014 Baltic Ave., 3 story, basement, brick, steel, 813 Baltic Ave., separate contracts. $150,000. D. W. Haining, 225 Chelsea Bank Bldg., archt.

N. Y., Brooklyn—Dawol Building Corp., H. Wolfenson, pres., 661 East 49th St., 6 story apartment, East 18th St. and Avenue T, separate contracts. M. Klein, 65 Court St., archt. $675,000.

N. Y., Brooklyn—Samfred Holding Corp., A. Fishkind, pres., 1355 Ocean Parkway, 6 story, 99 x 100 ft. apartments, Ocean Parkway and Avenue O, separate contracts. $213,000. S. L. Malkind, 92 Court St., archt.

N. Y., Kew Gardens—Kew Gardens Development Corp., 181 East 53rd St., 6 story, 140x181 ft., Lefferts and Metropolitan Aves., separate contracts. $350,000. Cohn Bros., 363 Stone Ave., Brooklyn, archts.

N. Y., Long Island City—Tilden Arms, Inc., 16 Court St., Brooklyn, 6 story, 84x321 ft. Austin St. and Ascan Ave., separate contracts. $500,000. B. Braunstein, Jamaica, archt.

N. Y., New York—Henry Mandel, 10 East 40th St., 19 story apartment, 196 7th Ave. and 212 West 22nd St., separate contracts. $1,000,000. Farrar & Watmough, 10 East 40th St., archts.

N. Y., New York — Morris Avenue-196th Street Corp., N. Mancino, pres., 761 East 220th St., apartment, Morris Ave. and 196th St., separate contracts. $150,000. L. R. Uffner, 202 West 40th St., archt.

N. Y., New York—S. E. Z. Engineering Corp., 1070 Anderson Ave., 6 story, Anderson Ave. and 164th St., separate contracts. $170,000. C. Kreymborg, 2534 Marion Ave., archt.

N. Y., New York — Wiloona Holding Corp., W. Schaller, pres., 75 West 190th St., 6 story, Topping Ave. and 175th St., separate contracts. $150,000. N. Rotholz, 155 East 42nd St., archt.

N. Y., Ridgewood—Prisco & Soreno, 90-37 Sutphin Blvd., Jamaica, apartments, DeKalb and Cypress Aves., separate contracts. $150,000. D. Levison, Jamaica, archt.

N. Y., Woodside—Elmboro Realty Co., 59th St. and 14th Ave., 6 story, 84x100 ft. apartments, 59th St. and Woodside Ave., day labor and separate contracts. $150,000. Gretsch & Creamer, Bible House, New York, archts.

Pa., Jenkintown—Jenkintown Manor Co., 4 story, basement, 48x206 ft., and 47x206 ft., steel, rein.-con., brick apartment, garage, plain found., Highland and Summit Sts., to T. J. Young, 20 South 15th St., Phila.

Pa., Phila.—M. E. Goodman, 247 South 60th St., 3 story, basement, 100x250 ft., rein.-con., brick, steel apartment, garage, Ellet and Cherokee Sts., separate contracts. M. Fruchbaum, 2114 Mebris St., Phila., archt.

Ont., Toronto — E. A. Frosst & Associates, 1006 Commerce & Transportation Bldg., general contract 4 story, basement, brick, concrete, steel, Jarvis and Carlton Sts., to R. H. Mason Constr. Co., 417 Strathmore Blvd. Est. $250,000.

SCHOOLS

PROPOSED WORK

Calif., Berkeley — University of California, sketches Class A men's gymnasium, on campus. $1,000,000.

La., New Orleans—Louisiana State Medical School plans by Weiss, Dreyfous & Seiferth, Maison Blanche Bldg., 60 x 225 ft. medical school, Tulane and Gravier Sts. $1,000,000.

Me., Waterville—Colby College, F. W. Johnson, pres., 518 acre site selected, and campaigning for $5,000,000 fund, for new college, Mayflower Hill. F. Larsen, Hanover, N. H., assoc. archt.

Mass., Boston—Boston University, 688 Boylston St., sketches by Coolidge, Shepley, Bulfinch & Abbott, Ames Bldg. and Cram & Ferguson, 248 Boylston St., group college units, to be arranged in quadrangle, covering 10 acres, Commonwealth Ave. between Cottage Farm bridge and Granby St. $5,000,000 funds being raised for same.

Mass., Cambridge — Parish of Our Lady of Pity (Roman Catholic), A. Millett, 35 Middlesex St., pastor, soon takes bids 3 story, basement, irregular sized, brick, stone, steel convent, plain found., Notre Dame St., North Cambridge, $150,000; also 2 story, basement, 85 x 145 ft., brick, stone, steel parochial school, plain found., Sargent and Notre Dame Sts., North Cambridge, $200,000. J. G. Morissette, 575 Essex St., Lawrence, archt. Noted Nov. 13.

Mass., Gloucester — Addison Brooks Gilbert Hospital, c/o Phillips & Holloran, archts., 19½ Main St., soon takes bids altering and constructing 2 and 3 story, basement, brick nurses home and ward hospital addition, plain found., Washington St. $150,000 or more. Noted Oct. 9.

N. J., Union City—Bd. Educ., 415 32nd St., revised sketches by J. D. Lugosch, 714 Bergenline Ave., 3 story, basement, brick, steel, rein.-con., plain found., West St. between 5th and 6th Sts. $850,000.

N. Y., Utica—Bd. Educ. plans by Bagg & Newkirk, U. G. and E. Bldg., East Utica High School. $1,220,000.

BIDS ASKED

Calif., Altadena—Feb. 9, by Bd. Educ. Pasadena School Dist., Junior High School, incl. 900 seating capacity rein.-con. auditorium, Lake Ave. and Calaveras St. $300,000. Noted Oct. 9.

Calif., La Jolla—Feb. 5, by L. J. Gill, archt., Sefton Bldg., San Diego, Scripps Institute of Oceanography, 2 story, 46 x 100 ft., rein.-con. laboratory, for University of California, 405 Hilgard Ave., $150,000. Noted Nov. 13, under "Buildings—Unclassified."

Conn., New Canaan—Feb. 19, by Town, Bd. Selectmen, G. T. Smith, Junior High School, 2 story, basement, 118 x 200 ft., brick, concrete, steel, incl. gymnasium, auditorium, 5 offices, plain found., South Ave. $225,000. J. N. Pierson & Son, 198 Jefferson St., Perth Amboy, N. J., archts. Noted Jan. 15.

Conn., West Haven (br. New Haven)—Town, W. Cox, School Bd., taking bids 2 story, basement, brick, steel school, Forest Rd., $150,000. D. E. Smith, 52 Temple St., New Haven, archt. Noted Dec. 4.

Ind., Lebanon — Feb. 6, by School Comrs., brick, steel, stone school, incl. gymnasium, auditorium. $150,000. C. Beeson, 220 Ben Hur Bldg., Crawfordsville, archt. Noted Dec. 4.

La., Monroe—Feb. 18, by Ouachita Parish School Board, Junior College, 3 story, rein.-con., brick. $250,000. J. W. Smith & Associates, Monroe, archts.

N. J., Bridgeville—Feb. 2, by Bd. Educ., W. Lantz, clk., at Warren Co. Court House, Belvidere, general contract 1 story, basement, brick, steel consolidated school. $150,000. Jacob & Everett, Commonwealth Bldg., Allentown, Pa., engrs. Noted Jan. 22.

N. Y., Great Neck—Bd. Educ., bids about Feb. 2, general contract 2 story, basement, brick, steel, rein.-con., plain found. $150,000.

Va., Richmond — Jan. 30, at office C. M. Robinson, archt., 1002 Times Dispatch Bldg., constructing Taliaferro Hall, (1st unit) group college buildings, for William and Mary College. $150,000. Total est. $500,000.

CONTRACTS AWARDED

Conn., Waterbury—City, M. J. Donovan, supt. schools, altering and constructing 2 story, basement, brick addition to B. W. Tinker Grade School, plain found., to Tremagilo Bros., Platts Mills. Est. $150,000; heating to M. J. Daley & Sons, 543 Bank St., electrical work to Weihn Electrical Co., 52 Western Ave., Est. $25,000. Noted Jan. 1.

Del., Greenwood—Delaware School Found., A. J. Taylor, vice pres., Du Pont Bldg., Wilmington, general contract 2 story, basement, 60 x 170 ft., brick, steel high school addition, to Bowden Constr. Co., 1607 Summer St., Phila., Pa., $103,887; plumbing and heating, to T. T. Weldin & Sons, 916 Orange St., $23,850; electrical work, to Arrow Electric Co., 5112 Whitby Ave., Phila., Pa., $4,240. Grand total $131,977. Noted Dec. 25.

Del., Lincoln City—Delaware School Foundation, A. J. Taylor, vice-pres., Du Pont Bldg., Wilmington, general contract 2 story, basement, brick, steel, to P. Lange, 28 Yale Rd., Audubon, N. J.; plumbing and heating, to H. D. McCullough, Milford, electrical work, to Arrow Electric Co., 5112 Whitby Ave., Phila., Pa. Est. $150,000. Noted Dec. 7.

D. C., Wash.—District Comrs., District Bldg., general contract Anthony Bowen School addition, to Louden-Rust Co., $104,495. Noted Jan. 1.

D. C., Wash.—District Comrs., District Bldg., Greenleaf Whittier School, to Graham Constr. Co., $83,940. Noted Dec. 18.

D. C., Wash.—District Comrs., District Bldg., addition to Congress Heights School, to Fidelity Constr. Co., Wash., D. C., $138,795.

Ill., River Forest—Rosary College, general contract 4 story, 60 x 250 ft., brick, concrete addition to girls college, to Math Raven Co., 326 West Madison St., Chicago; plumbing, to M. J. Corboy, 405 North Des Plaines Ave., Chicago; heating, to S. J. Reynolds Co., 2223 Ogden Ave., Chicago.

Ind., East Chicago—School Comrs., general contract Michigan Ave. Grade School, 76 x 156 ft., rein.-con., brick, to J. F. Rahn, 150th St. and Railroad Ave.; heating and plumbing, to H. McAuliffe ,East Chicago; electric wiring, to Yeager Electric Co., East Chicago. Est. $150,000.

Mass., Stoughton — Immaculate Conception Roman Catholic Parish, T. P. Callahan, pastor, 2 story, basement, brick, stone school, plain found., to F. G. Jacques Constr. Co., 416 Weld St., West Roxbury. Est. $150,000. Noted Dec. 25.

Mich., Detroit — Bd. Educ., 1354 Broadway Ave., (a) general contract (b) heating (c) electrical work (d) steam heating and plumbing (1) 2 story, basement, brick, stone, steel, concrete school, Lantz Ave. (2) 2 story unit for school, Lappin Ave. (3) addition to school, Wagner Ave., to Rozycki Bros., 1950 East Canfield St., (a1) $153,520; to Harrigan & Reid, 1365 Baker St. (b1) $52,155; to Jackson Electric Co., 2425 Grand River Ave. (c1) $11,649; to Stibbard Constr. Co., 3000 Grand River Ave. (a2) $50,000 (a3) $47,750; to D. Miller, 1720 Brush St., (d2) $32,844; to J. Wida, 541 East State Fair Ave., (c2) $4,798; to J. W. Partlan, 14290 Goddard St., (d3) $14,854; to Donahue & Shoebottom, 357 East Jefferson St., (c3) $2,210. Grand total $409,780.

Mich., Detroit — Bd. Educ., 1354 Broadway Ave., C. A. Gadd, bus. mgr., 3 story, basement, brick, steel, rein.-con., stone plain found., Kelly Ave. to A. W. Kutsche Co., 2111 Woodward Ave.; heating, to Donald-Miller Co., 1720 Brush St., total est. $382,139; general contract Finney School, brick, steel, stone, rein.-con., to F. N. Cooper, 6370 Gratiot Ave., est. $70,026. Noted Dec. 25.

O., Magnolia—Village, 2 story, basement, brick grade and high school, incl. auditorium, to Wendling Bros., Dover. $150,000.

Pa., Collegeville—F. R. Watson, archt., Architects Bldg., Phila., 3½ story, basement, 100x186 ft., rein.-con., brick, steel science hall, plain found., to F. L. Hoover & Sons, 1023 Cherry St., Phila. Est. $500,000. Noted Dec. 18.

STORES

BIDS ASKED

Mass., Boston — Owner, c/o Richman Bros. Co., lessee, 1600 East 55th St., Cleveland, O., taking bids 8 story, basement, brick, stone, steel store and sales buildings, 30,000 sq. ft. floor space, plain founds., 496 Washington St. corner Bedford St. $150,000. Private plans.

Mass., Cambridge—See "Stores."

CONTRACTS AWARDED

Mass., Boston—New England Stationery Co., 185 Milk St., reconstructing 7 story, basement, brick, stone, concrete, steel store and office, 185-187 Milk St., to G. T. McLauthlin Co., 120 Fulton St. Est. $150,000. Noted Jan. 22.

Mass., Cambridge—C. P. Cronin, 45 Fresh Pond Parkway, 3 story, basement, brick, stone store, office, plain found., 36-42 Church St. and Palmer St., separate contracts. $150,000. W. P. Galvin, 34 Brattle St., archt. Noted Jan. 22.

THEATRES

CONTRACTS AWARDED

Calif., San Mateo—W. S. Leadley, 207 2nd St., 4 story, 1,000 seating capacity, Class C concrete theatre, incl. stores, to Leadley & Wiseman, 207 2nd St. $150,000.

UNCLASSIFIED

PROPOSED WORK

Mass., Quincy—RAILROAD PASSENGER STATION—New York, New Haven & Hartford R.R., A. P. Russell, pres., South Station, Boston, sketches passenger station at Quincy Adams, $150,000 or more. Private plans. Noted Oct. 9.

BIDS ASKED

Calif., Los Angeles—NEWSPAPER PUBLISHING PLANT and OFFICE—G. B. Kaufmann, archt., Union Bank Bldg., bids about Feb. 3, part 3 and 4 story, basement, sub-basement, steel, concrete, South Bway., for Times-Mirror Printing Co. $500,000. Noted Jan. 1.

Ind., Indianapolis—EXCHANGE—Indiana Bell Telephone Co., 256 North Meridian St., bids about May 1, 8 story, basement, 100 x 200 ft., rein.-con., limestone, New York and Meridian Sts. $1,000,000. Vonnegut, Bohn & Mueller 610 Indiana Trust Bldg., archts. Noted Aug. 28.

N. J., Wickatunk—INSTITUTION—W. J. Boegel, archt., 185 Madison Ave., New York, new bids about Apr. 1, general contract, 3 story, basement, brick, steel institutional building, for House of Good Shepard, 3rd Ave., Newark. $250,000. Former bid rejected. Noted June 19.

N. Y., New York—STORAGE, etc.—Calma Realty Co., J. Mayer, pres., 11 West 42nd St., bids about Feb. 1, general contract 7 story storage, office, 117 West 48th St. V. Bark, 11 West 42nd St., archt. Noted Jan. 15.

Va., Richmond — HOME — Feb. 4, by Bd. Comrs. Home for Needy Confederate Women, 3 East Grace St., new home on Soldiers Home Property, $350,000. L. Smith & Van Dervoort, 6th and Franklin Sts., archts.

CONTRACTS AWARDED

Mo., St. Louis—MERCHANDISING MART—Terminal Railroad Assn., 1800 Market St., and St. Louis Mart, Inc., lessee, heating and ventilating in merchandising mart, to Sodemann Heat & Power Co., 2301 Morgan St.; plumbing, to Ryffel & Ratz Plumbing Co., 1340 North Kingshighway; electrical work, to Rick Electric Co., 1622 Chestnut St.; automatic sprinkler system, to Globe Automatic Sprinkler Co., Pierce Bldg.; elevators, to Westinghouse Electric Elevator Co., Ambassador Bldg. Noted Dec. 25, under "Buildings—Unclassified."

See proposal advertising on page 85

Constr. News page 45

HERCULES ENGINES

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